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THE REGULATION OF NIAGARA POWER.

When the first move was made toward harnessing the immense power represented by Niagara Falls, there was little thought that sufficient water would ever be diverted to make any appreciable impression upon the appearance of the water which passes over the falls. With an immense increase in the demand for electric power, however, and the corresponding development of hydroelectric projects, it became clear that unless some restriction was put upon the diversion of water from the Niagara River, the scenic beauty of this wonder of nature might be seriously interfered with. The Governments on the two sides of the river consequently came to an agreement respecting the limitation in the development of power at this point, and the renewal or modification of this agreement is now under consideration by Congress.

In the report which has recently been made to the United States Senate by the engineering corps of the army, there is a contribution by Professor Shenehon, of the University of Minnesota, on this subject. One suggestion which he makes is deserving of attention, and perhaps of adoption, as a practicable way of obtaining the great benefits of cheap power from Niagara without destroying the beauty of the falls. The suggestion is to divert the water for power purposes at night to any extent that may be desired, while restoring the flow to the river bed during the daylight hours.

This seems like a very feasible method of reconciling the opposing interests which are concerned with the development of power and with the retention of the scenic effects. So far as the power is used for street lighting and similar purposes, the demand naturally comes during the hours of darkness, and there is no hardship in reducing the power during daylight hours. There has, however, grown up in the neighborhood of Niagara Falls a large group of industries which can make use of power throughout the entire 24 hours. Many of these depend for their existence upon obtaining power at a very cheap rate, and this is made possible only by continuous operation. In such cases there would be some hardship in limiting the use of power to the night time. If, however, all-day use of power was limited to those companies which are already established, and further diversion of water was confined to the night time, there is no doubt that great use could be made of such additional power at the times when it was available.

THE NATIONAL ELECTRIC LIGHT ASSOCIATION CONVENTION.

Plans are practically complete for the opening of the Seattle convention of the National Electric Light Association on the evening of June 10. The Exhibition Committee reports everything going along in good fashion and the Hotel Committee is pleased with the great interest shown in making early reservations.

The secretary's office is to be congratulated upon having been able to have prepared thus far in advance so many of the papers which will be presented at the convention. This has always been a matter of great concern and few men realize the amount of work involved in preparing the advance material for a gathering of this importance and comprehensiveness.

It is gratifying to realize, now that this great convention of central-station interests is so closely impending, that there is coming over the country a feeling of cheerfulness and optimism that augurs well for a considerable gain in material prosperity during the next twelve months. The gathering together of the captains of industry will have a very beneficial effect upon the electrical business in general, and this year particularly, entirely outside of the advances of a technical nature which may be stimulated as a result of this convention, the great activity that will be indicated as a result of enlightened public policy and the adopting of modern commercial methods, will do much to bring about a greater activity than usual among those who possibly have been a little dormant in their characteristics.

What the business needs today more than anything else is a greater degree of confidence in the future of the centralized production of electrical energy. The technical advances are in the hands of their masters, and we can rest assured that so far as operation is concerned the United States will continue far in advance of every other nation. On the other hand, no matter how great may be the increase in the economy of operation and in the handling of technical details, unless there be a full confidence in the future of the industry there will be a hesitancy upon the part of capital to hazard large sums for laying down stations of great capacity and for increasing the network of distribution. It is fortunate, therefore, that a convention of this character will gather together the men upon whose courage will depend so much of the commercial advance that is to be made in the electrical industry. The exchanging of confidences, the relating of experiences, and the formulating of new ideas cannot but help to give these men confidence in one another, and this confidence in return will create a greater desire to make a further hazard, believing resolutely in the ultimate success of a business which is designed to meet the demands of an enlightened public conception of the function of a public-utility corporation.

ELECTRIC RELIEF FROM NOCTURNAL NOISE.

This is the age of the strenuous life. Probably at no period in human history has there been so exacting and constant a demand on the nervous forces of man as is being imposed by the industrial, economic and political conditions of modern life. In our large cities these conditions are so severe that they frequently produce derangements of the nervous system from mild but chronic nervousness to complete nervous prostration and in some cases even insanity.

Physicians are generally agreed that brain workers and sufferers from nervous disorders need particularly quiet and restful sleep to permit the nervous system to recuperate from its strain of the preceding day. But what does the large city offer toward reposeful sleep at night?

The number of night occupations is steadily increasing and with them the nocturnal noises and disturbances. The steam railroads are serious offenders with their frequent train movements accompanied by puffing and snorting engines that can be heard for many blocks. Gasoline taxicabs, touring cars, trucks and motorcycles rend the night with their pestiferous exhausts or clanking gears. The horses of milkmen, bakers and other early delivery men pound the hard pavements with their ponderous hoofs and their wagons rattle as they strike uneven spots in the roadway. Such noises are apparently the unavoidable accompaniments of the nightly business of the city, even though they mean torture to the sufferer from insomnia, especially in summer when windows are more generally open.

By contrast, however, is the steady and relatively quiet rolling of electric elevated trains and electric street cars; like the roll of distant thunder, it gradually increases in volume and again slowly dies away without grating on the nerves as does a puffing exhaust. But the gentlest of night noises is that of an electric automobile; it is so quiet as to be almost imperceptible; if it is noticed at all, it is as soothing as a running brook.

The number of brain workers is increasing in proportion to manual workers. For the former the need of absolute quiet during the sleeping hours is greater than for those muscularly employed. The city is obligated to promote the well being and comfort of its residents both by day and by night. The abatement of night disturbances is possible most effectively by the electrification of those means of transportation still operated by purely mechanical or animal means. In view of the other marked advantages of the electrification of railroads and the general employment of electric vehicles, it is to be hoped that greater impetus will be given to both these movements by those who have the welfare of the community at heart.

THE SIGNIFICANCE OF ELECTRICAL PLAYS.

The growing tendency of playwrights to draw material from industrial sources is a suggestive sign of the times, and one which has a distinct advertising value to various arts. Electrical interests have of late come somewhat to the front of the stage through the use of motors and lighting of specialized character as auxiliaries, and there is no doubt that public interest has been very much aroused by the uses made of electricity in connection with some of the more modern ballet performances as well as in regular drama. In a recent production a scene of compelling interest is set in and beside a cable manhole, the participants being a repair gang, foreman and factory superintendent. The comedy illustrates the errors of inexperience in a most effective way, and at the critical moment an embryo engineer just out of college discharges the maintenance crew for insubordination, and upon being ordered by the superintendent to repair a cable fault, creates a life-like short-circuit, shutting down a rail-mill and producing the most realistic effects. Such a drama, carried through on a sound technical basis, and aided by actual electrical equipment and tools, illustrates many phases of electrical service to a receptive public, familiarizes them with the importance of reliable operation, and probably accomplishes an educational result which in few other ways could be gained at such little expense or with such a lasting impression. It is to be hoped that more work of this kind will be forthcoming on both the regular and vaudeville stages.

ELECTRIC VEHICLES IN CHICAGO.

One has only to stand at the corner of a busy thoroughfare in the downtown district of a city like Chicago to realize the extent to which the power wagon is being utilized for handling merchandising of every character. From the light delivery vehicle, having all the characteristics of a runabout, to the giant truck which moves many tons of merchandise in a single load, the agility and facility of the power wagon are demonstrated every minute of the day.

The tendency of the time is for the quick movement of merchandise and the elimination of the horse-drawn vehicle in this direction. The trend of favor is toward the electric vehicle, not only because of its reliability and low maintenance expense, but because of the ease with which it may be handled, its cleanliness and its freedom from the possibility of doing damage to either itself or to the building in which it may be housed.

The work of the Electric Vehicle Association of America, which has been in existence a little over two years, has had a noteworthy effect in increasing the popularity of the electric vehicle. Co-ordinating the interests of the manufacturers of electric vehicles, the manufacturers of storage batteries and other accessories, the central stations and the industries benefited by the adaptation of the power wagon, this association is promoting an organized effort to bring to the prospective user the great advantages of the electric vehicle for the transportation of every kind of material.

As was announced last week, a Chicago section of the Electric Vehicle Association of America has been inaugurated, chiefly through the efforts of the Commonwealth Edison Company acting in concert with every other element interested in promoting the sale of electric vehicles and electric vehicle accessories.

On other pages of this issue there will be found some interesting and valuable data relating to the utility of the electric vehicle. To stimulate the equipment of large garages, through which it is believed the greatest measure of success can be achieved, the Commonwealth Edison Company has announced a new low rate for the charging of storage batteries for electric vehicles. Chicago is well adapted for this type of power wagon. Its streets are practically level over the entire city. Due to the wide separation of the various steam railway terminals and the fact that the principal distributing points are located in several parts of the city, the teaming per capita is probably greater in Chicago than in any other American city. The use of the electric power wagon is facilitated by the level streets, all of which are well paved. In the program for city improvement, repaving of those streets which are not now in first-class condition will take a prominent part. Within two years it is expected that Chicago will have a great mileage of practically level streets between its railway terminals and principal distributing points paved in first-class condition.

All of this applies not only to the power wagon, but to the pleasure car as well. As a matter of fact, however, if the proportion of electric vehicles now seen upon the city streets as compared with any other type of vehicle is maintained, Chicago will have no difficulty in keeping the leadership which it attained some time ago.

A TELEPHONE CONVENIENCE.

The official directory of the Southwestern Home Telephone Company, Redlands, Cal., which has just come to hand, presents a convenience which has been generally adopted by telephone companies, but which would be much appreciated by their patrons. Following the alphabetical list of subscribers and preceding the classified business directory there is a numerical list of telephone numbers accompanied by the first three letters of the name of the subscriber. This makes it possible when one knows the telephone number of a subscriber only to determine the name of that subscriber. For instance, if a message is left with only a telephone number it is possible by referring to the directory to obtain the name of the party who wishes to be called, before the call is made. Other uses of such a directory list will naturally suggest themselves and the Southwestern Company is to be congratulated on the service rendered by putting this convenience in the hands of its subscribers.

First Annual National Gas Engine Show.

The first annual National Gas-Engine Show, to include everything in gas power and allied lines, will be held in Milwaukee, Wis., June 17 to 22, inclusive, in connection with the convention of the National Gas Engine Association. This is in accordance with plans laid at the last meeting of the association in Cleveland. The show will be held at the Auditorium, where about 100 exhibition spaces have been laid out.

The central portion of the main floor will be devoted entirely to engines of various kinds, and these will be shown in actual operation on gas or gasoline. All engines will be suitably muffled and shown under actual running conditions, a feature that will make the show absolutely unique in exhibits of gas engines. Not only will there be shown the stationary or heavy-duty type of engine, but there will also be the small farm engine, the marine and automobile engine, and possibly aeronautic motor. Space adjoining the building will provide an arena for tractor exhibits.

Surrounding the engine exhibits will be spaces allotted to the manufacturers of accessories, such as batteries, spark plugs, coils, magnetos, lubricators, etc.

Byllesby Delegates to National Electric Light Convention.

H. M. Byllesby & Company and affiliated companies will be represented at the annual convention of the National Electric Light Association at Seattle, June 10-13, by 24 delegates, as follows: H. M. Byllesby, Arthur S. Huey, Harold Almert, E. L. Callahan, W. H. Hodge, Chicago, Ill.; C. E. Groesbeck, S. B. Niccolls, A. F. Douglas, Alexander Lambie, Portland, Ore.; George H. Harries, Louisville, Ky.; T. K. Jackson, Mobile, Ala.; W. F. Raber, Pueblo, Colo.; J. W. Gillette, Fort Smith, Ark.; A. Larney, St. Paul, Minn.; B. W. Cowperthwait, Faribault, Minn.; L. G. Gresham, Bluefield, W. Va.; H. C. Hoagland, Muskogee, Okla.; H. H. Jones, San Diego, Cal.; W. W. S. Burler, Stockton, Cal.; H. L. Jackman, Eureka, Cal.; R. M. Jennings, Eugene, Ore.; D. C. Greene, Marshfield, Ore.; W. B. MacDonald, Kalispell, Mont.; Elmer Dover, Tacoma, Wash.

The delegates from the east will go to the convention on the "Orange Special" over the Chicago, Milwaukee & St. Paul lines, leaving Chicago 4:30 p. m., June 6, arriving in Seattle Sunday, June 9, at 2:30 p. m. About 75 reservations have already been made for the "Orange Special," assuring beyond question the success of this train, which will be one of the two specials leaving Chicago.

Seattle Exhibits.

The Exhibition Committee of the National Electric Light Association reports that nearly all of the available booths at the Seattle convention have been taken, and that the exhibits embrace a very wide range of the application of electric energy. However, there are still a few very desirable booths available, so that any manufacturer not having already done so should make immediate application to the secretary of the committee, Walter Neumuller, 55 Duane Street, New York.

The exhibits will be held in the State Armory, a building excellently equipped for the purpose. The arrangement of the 70 booths, comprising about 8,150 square feet, is such as to make each exhibit accessible and attractive in itself. Special arrangements have been made for the economical shipment of exhibit material from the East, through grouping at Chicago and reshipping in carloads.

Another Special Train for the Seattle Convention.

The Electrical Development League, of San Francisco, is making arrangements for a special train to leave San Francisco on the evening of June 8 to attend the Seattle convention of the National Electric Light Association. This train will be known as the Golden Poppy Special. A through sleeper leaving Los Angeles on the evening of June 7 will be attached to this train. Further particulars may be obtained from the secretary, E. B. Strong, 109 Rialto Building, San Francisco, Cal.

Elliott Cresson Medals Awarded.

At the meeting of the Franklin Institute, Philadelphia, on the evening of May 15, presentation of Elliott Cresson medals was made to Alexander Graham Bell, Elihu Thomson, S. W. Stratton and Edward W. Morley. Addresses were made by Professor Thomson on "Recent Development in the Electrical Art;" by Dr. Stratton on "Metrology in Relation to Industrial Progress," and by Professor Morley on "Fundamental Chemical Constants."

No Independent Telephone for New York.

The efforts of the New York Electric Lines Company to open the way for an independent telephone system in New York City has been balked by a decision in the Supreme Court dismissing the suit of this company against the Board of Estimate. Permission was given in 1883 to lay subways for telephone conduits and the Board revoked this action in 1908 owing to the fact that up to that time no rights conferred by the franchise had been exercised.

Montefiore Prize.

The conditions which will govern the awarding of the prize to be given in 1914 by the Association des Ingenieurs Electriciens Montefiore, Liege, Belgium, have been announced. This prize amounts to 20,000 francs, and is awarded every three years. In 1914 it will be granted for the best work presented on the scientific advancement and progress in technical applications of electricity in all branches. Papers must be typewritten in French or English. The jury will be formed of ten electrical engineers, of whom five will be Belgians and five foreigners, and must be received not later than March 31, 1914. Further particulars can be obtained upon application to the secretary of the association, Gustave L'Hoest.

Engineer Better President Than Lawyer.

Speaking on the subject of the "Morals of Efficiency," before the Electric Club of Chicago, on May 9, David Gibson, of Cleveland, paid a high tribute to men engaged in the electrical industry, particularly engineers, who he said are able to deal in cause and effect problems rather than in precedents. For this reason he held that an engineer would make a better president than a lawyer.

The largest attendance of the year was on hand to welcome Mr. Gibson, whose interesting address proved highly entertaining.

Byllesby Company Negotiating for Minneapolis General Electric Company.

It is understood that H. M. Byllesby & Company, Chicago, are negotiating for the purchase of the majority of the capital stock of the Minneapolis General Electric Company, through Stone & Webster. Should this transaction be consummated the Minneapolis Company would become a part of the Consumers Power Company, the latter comprising a chain of public utilities in southern Minnesota.

Canadian Pacific May Electrify Mountain Sections.

It is reported that the Rossland branch of the Canadian Pacific Railway in British Columbia and possibly several of its mountain sections, are likely to be electrified. The Canadian Pacific is the most extensive railway system in Canada.

Doherty Managers to Meet.

The annual conference of the managers of the numerous properties operated by H. L. Doherty & Company will be held in Denver, Colo., June 4 to 12 inclusive.

Victor H. Tousley.

The position of the municipal electrical inspector is in many ways a unique one. He is an electrical engineer with the public, the central station or the isolated plant, the electrical contractor, and, in a measure, the manufacturer of current-consuming appliances for his clients. While, primarily, his duty is to make sure that unsafe electrical construction is prevented in his territory, the successful inspector must, in every piece of work undertaken, also make sure that none of these interests is accorded unfair treatment. Moreover, if his efforts are to be highly effective, the inspector must possess such technical knowledge and skill as to enable him to command the good opinion of other specialists in the electrical field, and he must, at the same time, be a man habitually tactful and patient in the performance of every duty.

In the case of the official who directs the work of other electrical inspectors there must not only be the qualifications just enumerated, but he must also have good judgment in the matter of selecting assistants and be able to direct the work of these wisely and well. A man who measures up to this high standard in an unusual degree is Victor H. Tousley, chief electrical inspector of the City of Chicago.

For the sake of a better appreciation of the real scope of Mr. Tousley's position some account of the Department of Electricity of Chicago is doubtless in order. This department was created by ordinance in 1898, and a Bureau of Electrical Inspection provided for. Prior to that time, electrical inspection had been carried on under the supervision of the superintendent of the city's telegraph system. The Department of Electricity now has charge of the fire-alarm and police-telegraph systems of the city, of municipal lighting, and of the inspection of all electric wiring, both within buildings and out of doors. The installations within the jurisdiction of the inspection bureau include, among other things, over 5,000,000 incandescent lamps, nearly 50,000 arc lamps, approximately 300,000 horsepower in motors and about 6,000 electric signs. The electrical inspections made last year aggregated 77,000, in round numbers.

When the Bureau of Electrical Inspection was established, in 1898, there were but 10 inspectors. Working under Mr. Tousley's supervision now, however, there are 45 men engaged in the inspection of inside wiring alone, to say nothing of the number making inspections of installations of other kinds.

Mr. Tousley became connected with the Department of Electricity the year it was officially established, and he had previously received training which fitted him especially to take up work of this kind.

He was born in Fond du Lac, Wis., in 1875, but came to Chicago as a boy, where he attended the grammar schools of the city. He was also a student in the Englewood High School, in which school he paid special attention to the study of natural philosophy. Later on he attended Armour Institute of Technology as a student of electrical engineering. Finishing his course at Armour in 1897, he took up electrical construction, working in Chicago.

Victor H. Tousley,
Chief Electrical Inspector, City of Chicago.

In Mr. Tousley's first position with the city he had charge of night work in connection with the street-lighting system, but was promoted to a place in the Bureau of Electrical Inspection in 1901. He became assistant chief inspector in 1907, and was made chief inspector three years later.

As a writer on electrical construction, Mr. Tousley is widely and very favorably known, and he has also made noteworthy contributions to the electrical literature of other branches of the industry. With Henry C. Horstmann, he is the author of the following books: "Modern Wiring Diagrams," "Electrical Wiring and Construction Tables," "Modern Electrical Construction," and "The Electrician's Operating and Testing Manual." Still another book, on illumination, by the same authors, is now in press.

Mr. Tousley takes a lively interest in all other means of improving conditions in the fields of electrical construction and inspection. He is a member of the Western Association of Electrical Inspectors, of which body he has been president. He is also a member of the Electrical Committee of the National Fire Protection Association, this being the committee which has charge of the revision of the National Electrical Code, whenever revisions are necessary. There are comparatively few men in the country who make so thorough a study of electrical construction and inspection as does Mr. Tousley, or who are so well qualified to speak with authority on these topics. His advice concerning matters of this nature is always received gladly and with profit.

Annual Entertainment, Commonwealth Edison Section, N. E. L. A.

On the evening of Friday, May 10, the second annual entertainment of the Commonwealth Edison Section, National Electric Light Association, was given, an amateur performance being followed by a dance in the Gold Room of the Auditorium Hotel, Chicago.

In order to accommodate the large membership of the Section it was necessary to rent the Auditorium Theater, which has a seating capacity of about 5,000. The boxes were occupied by officers of the company and members of various committees. Other seats were given out according to length of membership.

The entertainment consisted of several parts, the first of which was a minstrel performance. After this there were two plays, one given by the Electra Society of the Commonwealth Edison girls, and an operetta, "Pasquita," presented under the management of Harold Wright.

Music was furnished by the Commonwealth Edison Section orchestra, directed by M. L. Eastman.

Chairman Schuchardt, in the course of the evening, announced the names of members who are to be sent by the Section to the Seattle Convention. These are as follows: Harold Wright, William R. White, C. A. Lind, M. L. Eastman, Harry L. Gannett, and A. D. Bailey.

Electrical Papers at Eighth International Congress of Applied Chemistry.

At the Eighth International Congress of Applied Chemistry, which will be held in Washington, D. C., September 4 to 13, 1912, a number of papers of interest to electrical men will be presented. Among these are the following: "A Controlling Device for Electric Furnaces," by C. B. Thwing; "The Thermal Ohm; a New Unit of Thermal Resistance," by Carl Hering; "Notes on Electrolytic Iron," by Sherard Cowper-Coles; "The Silver Coulometer," by C. A. Hulett and C. D. Buckner; "The Function of Addition Agents in the Electro-Deposition of Copper," by Elwood Spear; "Mechanical Polarization in Electrolytic Cells," by Alan A. Claflin; "Conditions Which Control the Formation and Nature of Electrolytic Zinc Coatings," by Alfred Sang; "Recent Developments in the Electrical Steel Furnace," by P. Heroult; "Qualities of Carbon as Influencing Dry-Cell Construction," by Carl Hambuechen; "Electrolytic Polarization," by W. S. Franklin; "Heat Losses in Furnaces," by F. A. J. Fitzgerald; "Inclusion and Impurities in Electrolytic Silver," by C. D. Buckner, G. A. Hulett and J. Stanley Laird; "Electric Iron Smelting in Scandinavia," by Thomas D. Robertson; "Electric Induction and Resistance Furnaces," by C. H. Vom Baur; and "Power Supply Characteristics of the Electric Furnace," by Charles P. Steinmetz.

Meeting of the National Fire Protection Association.

The sixteenth annual convention of the National Fire Protection Association was held in Chicago, May 14, 15 and 16. The attendance was good and the program long and interesting. The first session of the opening day was taken up with the address of the president, W. H. Merrill, and with the reading and discussion of reports of committees on various matters affecting the organization. In the afternoon there were read messages to to the convention from President William H. Taft, Governor Deneen of Illinois, and Carter H. Harrison, mayor of Chicago.

Following the reading of these messages the consideration of committee reports was continued. These covered such matters as high-pressure fire-service systems, mine fires, hose couplings and hydrant fittings, automobile garages, and so on. Included in these reports were the report of the Electrical Committee of the Association, and of a Committee on Electric Railway, Light and Power Properties.

The first of the last two reports referred to was a statement of the proceedings of the meeting of the Electrical Committee held in Boston, March 27, and reported in our issue of April 6. As is generally known, this committee has charge of revising the National Electrical Code from time to time.

The most important matters embodied in the report of this Committee, of which F. E. Cabot of Boston is the chairman, relate to the use of motor-driven moving-picture machines and the grounding of the secondaries of transformers and low-potential electric circuits. It will be recalled that at its Boston meeting the Electrical Committee decided that the National Electrical Code should be changed so as to permit the approval of motor-driven moving-picture machines of certain approved types; and also that the Code require the grounding of transformer secondaries instead of simply recommending this practice, as it now does.

An especially noteworthy event in connection with the presentation of the report of the Electrical Committee to the Convention was a fitting testimonial accompanied by appropriate resolutions proposed by the Committee to C. M. Goddard, of Boston. Mr. Goddard was for many years secretary of the Underwriters' National Electric Association. The resolutions offered by the Electrical Committee and adopted unanimously by the Convention recounted that Mr. Goddard was the first man to call together, in 1892, representatives of several insurance organizations in a meeting which within a year led to the formation of the Underwriters' National Electric Association. From its formation until his recent retirement, he served the Association as its secretary. The work of this Association was turned over in March, 1911, to the National Fire Protection Association, at which time the former body passed a unanimous vote of thanks to Mr. Goddard in appreciation of his splendid and unselfish services.

The resolution recommended that the Convention extend to him its hearty thanks and assure him of the high esteem in which he is held by insurance interests, municipal inspection bureaus, manufacturers of electrical apparatus, electrical contractors, lighting companies, and, in short, all others affected by the requirements of the National Electrical Code.

These resolutions were prepared for the Electrical Committee by a special committee consisting of H. O. Lacount, J. E. Cole, H. R. Sargent, W. H. Blood, Jr., and E. McCleary.

C. N. Patten, of Cleveland, chairman of the Committee on Electric Railway, Light and Power Properties, stated that his Committee was not in position to submit its final report. He requested, therefore, that the Committee be continued in order that it might have an opportunity to confer further with the electrical interests.

Electric Lighting in New York City.

Vice-president John C. Sheehan, of the Long Acre Electric Light & Power Company, New York City, announced last week that his company had made a contract with Pliny Fisk, the well known financier of the banking firm of Harvey Fisk & Sons, to finance the Long Acre Company, and that $10,000,000 had been provided. The Long Acre Company has a franchise for electric light and power in New York City, and has been operating for a number of years in a moderate way. It is believed that an arrangement has been entered into between the Long Acre Company and the Hudson & Manhattan Railroad Company for the use of the tunnels of that company for stringing wires for the purpose of furnishing light and power.

Bangor Company Builds New Hydroelectric Plant.

The Bangor Power Company, a subsidiary concern of the Bangor Railway & Electric Company, has commenced work on the construction of a new hollow re-enforced concrete dam across the Penobscot River at the power station in Veazie, four miles above Bangor, to be 700 feet long and to cost upward of $150,000, replacing the old wooden structure which has been in use since 1847. The dam will develop more than 3,500 horsepower.

Wisconsin Summer School.

Announcement is made of the twelfth annual six weeks' summer school of the College of Engineering of the University of Wisconsin, which opens on June 24.

Courses of instruction and laboratory practice are offered in electrical, hydraulic, steam and gas engineering and allied branches. In addition, subjects may be taken in the College of Letters and Science.

Wireless Equipment for Lake Boats.

The Anchor Line, operating between Buffalo, Chicago and Duluth, has arranged to install wireless equipment on its steamers *Tioneata, Juiata and Octorara.* The equipment will be placed on board immediately.

Rubber Companies Merge.

Is is stated that arrangements are being completed whereby the Diamond Rubber Company and the B. F. Goodrich Rubber Company will form a consolidated company.

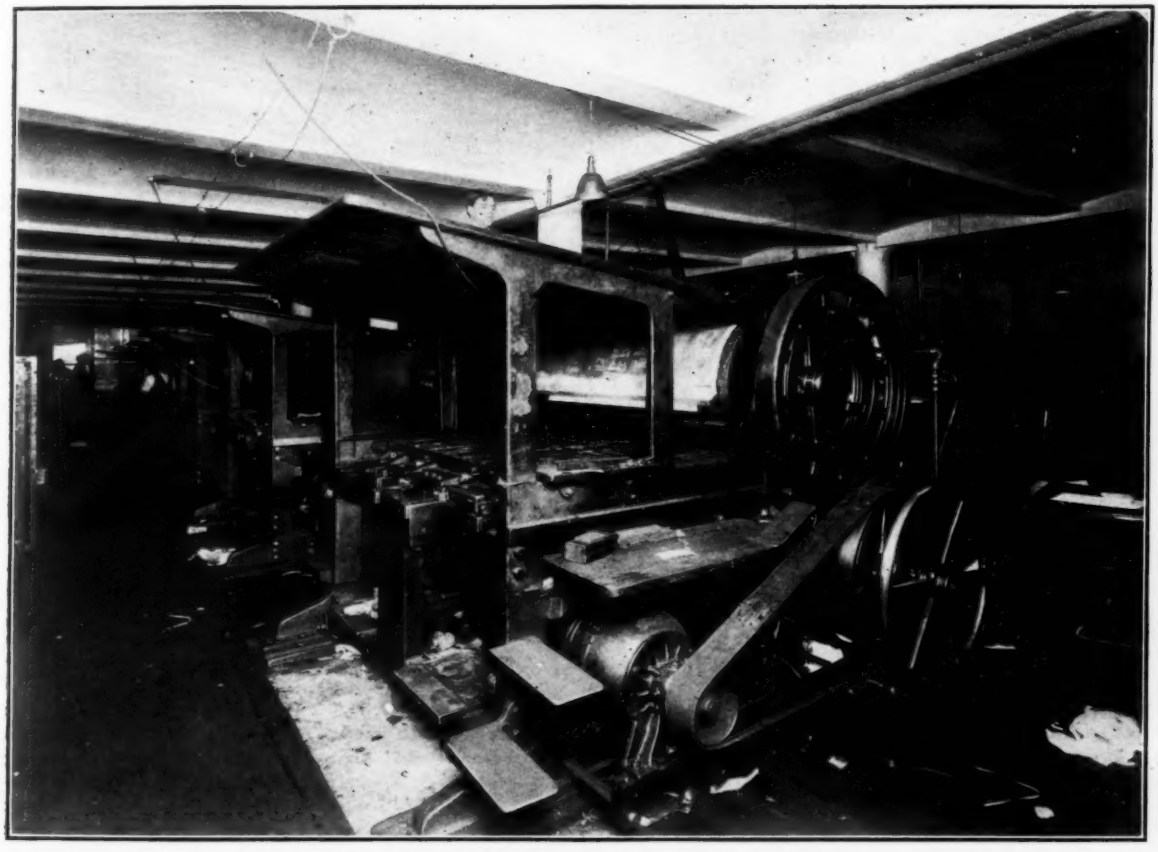
Coal Production of New Mexico.

The production of coal in New Mexico in 1911 was 3,148,158 short tons, with a value of $4,525,925.

Electricity in Printing.

In no other industrial field requiring motive power has electric drive become more deservedly popular than in the printing trade. From the inception of commercially distributed electric power, this industry was foremost in appreciating the many advantages of this system, which so admirably meets the exacting requirements imposed. The popularity of motor drive among job printers opened the way for similar up-to-date adaptations among the larger newspaper, magazine and book printing establishments, until today, the standards set for high-grade work, combined with rapid production, are only attainable where electric energy is used.

The demand for wide range of speed, the necessity for frequent starting and stopping and the importance of continuous service make central-station power essential for printing plants. Considerable data are given in this article on control, horsepower requirements, electric heating and selection of motors for printing machines.



Motor-Driven Presses, Kenfield-Leach Company, Chicago.

The many general advantages of electric motor drive are well known and admit of no logical argument. There are however several features attending the use of electric power in printing establishments, specifically, which should be given consideration in comparing electric with other methods of drive. These points are, economy, adaptability and space economy, cleanliness, speed control and reliability.

Economy. In a large plant where machines are driven from one engine room, which for several reasons is seldom centrally situated, there must necessarily be a heavy standing load of shafting and pulleys and a great loss of power in transmission, owing to the friction of innumerable belts and bearings. This loss, which varies from 50 to 75 per cent of the total power developed, is exceeded when it is found necessary to run only a few machines overtime and in other cases of light load. With electric drive the cost of non-productive power, or that required to drive line shafts, overcome friction, compensate for excessive belt slipping, etc., is minimized, since the electric motor may be applied directly to the productive machine, and, furthermore, power is used approximately in direct proportion to the work done. Motor-driven presses closely approach theoretical conditions for maximum production, since make-ready speeds may be instantly and correctly secured; operative speeds may be set and maintained to give the maximum number of perfect impressions per unit of time; and the inherent smoothness of acceleration and steady torque of the electric motor prolong the life of the press, permit better work and minimize delays attributable to the driving unit.

Adaptability. As all individually driven machines are independent of alinement with respect to countershafting, presses may in consequence be arranged to secure every advantage from natural lighting facilities, and, in addition, be so located as to obtain the most expeditious and efficient sequence of work. Almost every printer has ex-

perienced at some time the difficulty of arranging his machines to conform to fixed lines of shafting, and often troublesome and power-wasting devices, such as bevel gears, have to be employed. These difficulties are, of course, obviated with electric power and further advantage can be taken of the flexibility of the system to change the position of a machine whenever an alteration of routine makes it advisable.

Cleanliness and Light. The substitution of electric drive for other forms of power invariably results in a cleaner, more sanitary and efficient shop. Such conditions, furthermore, react favorably for the general uplift of the employees, thus indirectly influencing increased and improved production. Electric drive also eliminates dirt-disturbing belts, oil-throwing shafting, and hangers found in mechanically driven plants—an ever-present source of damage to the finished or nearly finished product. The elimination of shafting, hangers and belts also greatly improves the lighting conditions.

Speed Control. Owing to great variety of work performed, printing machinery as a rule requires a certain degree of speed variation in order that, with a given equipment and force of operatives, the maximum of high grade production may be turned out. All necessary speed variations are most readily, economically and satisfactorily obtained with electric drive and control. Each press is at all times under instant control, so that the entire attention of the operator may be devoted to the work in hand.

Reliability. Reliability is of course of vital importance, particularly in newspaper plants. The reliability of central-station power is too well known to need further comment here. However, with individual motor drive in case of breakdown of a motor or machine it is not necessary to shut down the entire plant as is necessary with mechanical drive.

Selection of Motors.

In deciding upon the field winding of motors for driving printing machinery, the circumstances of the drive must be considered. A plain shunt motor is most suitable where it is desired to drive groups of machinery by means of shafts and belting, and in all cases where constant speed is required. For driving machines direct through spur or chain gearing, the motor should be compound wound so as to give a larger starting torque. To overcome the initial torque of the driven machine there are an endless variety of combinations between shunt and series windings which can be arranged, and it should be borne in mind that the greater the percentage of series turns, the larger will be the starting torque, whereas constancy of speed is more and more sacrificed as the series field is increased.

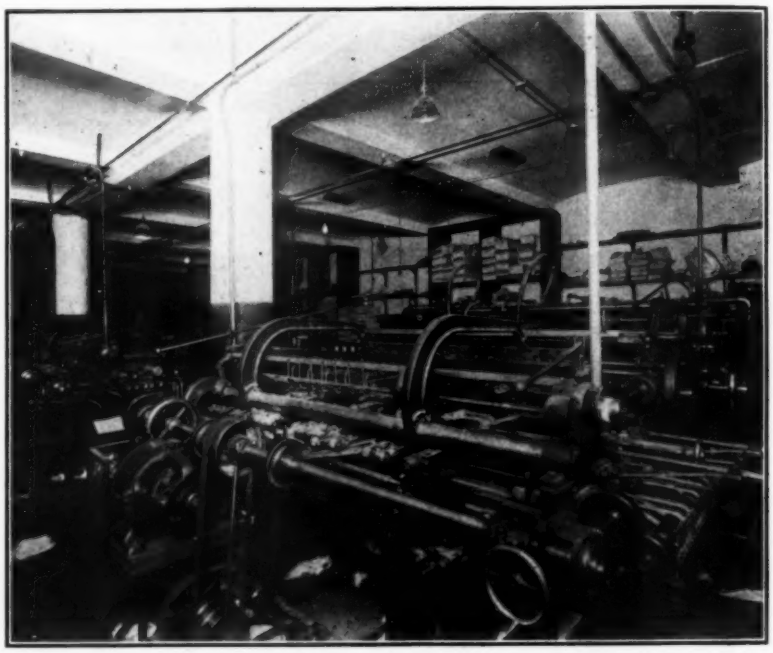
A good practice has been to allow 15 per cent of series winding, as being the most satisfactory winding for a motor driving a reciprocating printing machine, but sometimes this percentage leads to complaints of excessive speed on light loads, so perhaps an 8 per cent or 10 per cent allowance is more advisable.

With proper compounding, a smaller size frame may be used than when the percentage for series turns is too small, because it is often the case with printing machinery where there are heavy peaks in the load, as the table reverses or the impression is taken, that the sparking limit is reached before the overheating limit, and it is necessary not only that the motor should be large enough to do its work without overheating, but also it must be large enough to take peak loads without sparking.

Interpoles are now largely used by manufacturers to get over this difficulty. The interpole machine is no more efficient than any other, but will allow of a greater overload being carried temporarily without its reaching the sparking limit. The use of interpoles, therefore, enables a smaller size frame of motor to be used in cases where the load varies so as to cause sparking, even though the average load is not more than the motor is designed to carry.

The next point to consider is the speed, and this is most important, because price depends very largely upon the speed, and a compromise has often to be struck between questions of economy in first cost and of running cost. In selecting a suitable speed, it should be remembered that the slower it is the longer will be the life of the motor, also that a larger reduction than 5 or 6 to 1 is inadvisable in a single belt or gear.

Alternating-current motors give equal satisfaction for printing-press drive. Where a constant speed is required, the squirred-cage induction motor is recommended. For variable-speed machines the motors should be provided with slip rings by which resistance is introduced into the rotor for decreasing the speed. Single-phase motors are also extensively used for job presses, flat-bed presses and allied machines. These motors should be of the compensated repulsion-induction type, which have the characteristics of high starting torque, close speed regulation and high power-factor. These motors are entirely automatic in starting and can be connected directly on the circuit by means of a knife switch. They can be arranged for both constant and variable speed.



Motor-Driven Folding Machines, Kenfield-Leach Company.

Control.

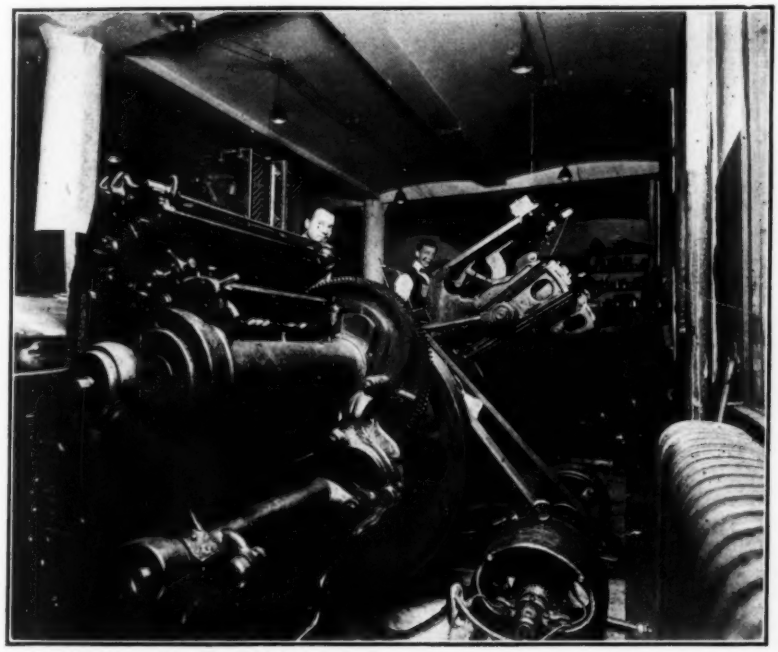
Too much importance cannot be attached to the proper selection of controlling apparatus, because by its nature the printing load is more trying to the control apparatus than to any other part of the installation. The process of preparing the printing machine for work, make-ready as it is termed, often requires as much time as the ac-

tual printing. During this period it is necessary frequently to move the machine a very small amount, perhaps only an inch at a time, and then to stop immediately. This is termed 'inching,' and unless suitable protective devices are incorporated with the controlling devices, the effect of repeatedly making and breaking the heavy starting currents will be rapidly to burn away the starting contacts. This destruction of switch contacts could be greatly reduced if the printer were to use two hands to operate the switches when inching, starting with the starting switch lever and stopping with the double-pole switch. This, however, has been found to be impracticable; the operator has his attention concentrated upon the machine and starts and stops from the starting switch only. The simplest form of provision against this difficulty consists in making the starting contacts large and easily renewable, and protecting the first contacts with a carbon break and magnetic blow-out. Such a switch with careful handling will answer very well and give long service, but if the trouble and cost of renewals of contacts are taken into consideration, it will be found cheaper in the long run to employ a more expensive form of starter in which the contacts are completely protected against damage by sparking.

A satisfactory starter for printing press work consists of the ordinary wall-type starting switch combined and interlocked with a magnetic circuit-breaker which takes the spark when the starter is turned to the "off" position. With such an apparatus, inching may be performed indefinitely without fear of damaging the contacts.

An automatic no-voltage release will of course be incorporated with every starting switch, but it is undesirable to add an overload release unless the same is so constructed as only to act upon maintained and not upon instantaneous overloads, the fact being that if the motor is properly proportioned to its work it is more or less overloaded at the instant of each impression, and at each reversal of the moving bed. An overload release of the ordinary type would have to be set to operate with so large a current as to afford no protection to the motor.

Full automatic control for rotary presses secures the best possible results, all things considered, and represents the highest development of the art of printing-press control. In connection with full automatic control the double-motor drive has been almost universally adopted on the larger presses. The essentials of full automatic control are the complete control of the press speed from any of a number of push-button stations located about the press, the complete protection of the equipment and operator against any emergency, and the production of an edition in the shortest possible time consistent with good results. One of the most important features of the controller is that essentially the same type, with necessary modifications, is used for both alternating and direct-current.



Motor-Driven Job Presses, Kenfield-Leach Company.

A typical direct-current drive for a high-speed sextuple press consists of a 60-horsepower 500/1000 revolutions per minute shunt-wound commutating pole driving motor, and a 7.5 or 10-horsepower constant-speed slow-motion motor. A corresponding alternating-current drive consists of a 60-horsepower, 900 revolutions per minute, slip-ring type driving motor, and a 7.5 or 10-horsepower squirrel-cage type slow-motion motor.

The large motor is coupled to an auxiliary shaft carrying the main driving pinion. The small motor is connected to the auxiliary shaft through reduction gearing and an automatic ratchet-and-pawl clutch. During the process of plating the cylinders, putting on blankets, or threading in the web, the small motor only is connected in circuit, driving the press through the reduction gearing at a speed of about 10 revolutions per minute of the cylinders. When the press is made ready the large motor is connected to the circuit and gradually accelerated. As it begins to drive the auxiliary shaft at a higher speed than it was being driven by the small motor through the reduction gearing, the pawls on the automatic clutch fly out by centrifugal force, slip over the ratchet teeth, and finally leave it entirely, thus mechanically disconnecting the small motor. The small motor is shortly thereafter electrically disconnected at the controller as the large motor increases in speed.

With the driving equipment mounted in the pit as is usually the case, the two motors will ordinarily be mounted on a common bed-plate and connected by spur gearing, conditions often arise, however, which make it desirable for the motors to be mounted separately, as when the drive is within the press frame. The reduction gearing and automatic clutch can be geared to any part of the drive shaft of the press or an auxiliary shaft, is desired.

The operation of the motors is entirely automatic, and is controlled by the push-buttons. The push-button stations are located, as many as desired, at different points about the press. From any station it is possible to start the press, increase or decrease the speed, or stop the press. Pressure on the "safe" button at any station opens the control circuit and renders the equipment inoperative, until the "run" button at that particular station is closed, releasing the "safe" button. A workman engaged about the press, plating the cylinders, or doing other work involving contact with the moving parts of the machinery, pushes the nearest "safe" button and thereby protects himself from injury. Pressure on the "fast" button causes the press to start, and to increase in

speed as long as the button is held closed. When the button is released, the press will continue to run at the speed it has then attained.

Another system of control for printing-press motors, known as multiple series armature and field control has occasionally been used on web presses. The diagram shown herewith illustrates a plan of using a motor with two windings and two commutators on the armature, with series parallel and shunt field control. This arrangement is especially good where a large range of production speeds is required.

Assume that A is the armature of a 25-horsepower motor geared or belted to a web printing press. When ready to run, the service switch S S is closed and the arm H of the controller moved to the right until controller brush C^1 touches on controlled dial D^1, closing the field circuit F C and exciting the field magnet F. Next the controller brush C^2 touches dial D^2, passing current through magnet circuit M C, exciting the magnet M, and closing the switch P in the jaws J and J^1, when current will pass from L^1 at Z through armature wire A C, brush B, one winding of armature A, brush B^1, armature circuit A C^2, switch P, armature circuit A C^3, brush B^2, another winding on armature A, brush B^3, armature wire A C^4, controller dial D, controller brush C, and back to the line L at Z^1 through the common return wire K. Whereupon the motor armature A will turn at 100 revolutions per minute with full field and the press, geared to the motor at a speed reduction of ten to one, will move slowly at ten revolutions per minute for threading or plating.

When ready for production speed, as the arm H passes on to the right and C^1 passes over the dial points (1, 2, 3 ...), the field of the motor is weakened until the motor runs at 600 revolutions per minute. At this speed the press will of course run at sixty revolutions per minute. At this point it is necessary to change the armatures from series to multiple, and as C^2 leaves D^2 and touches D^4, current is taken from magnet M and passed through the magnet circuit M C^1, exciting the magnet M^1, opening the switch P and at the same instant closing the switches P^1 and P^2. Now the current that starts into the wire A C from L^1 at Z, passes through the switch P^1 and direct to the dial D through the wire A C^5, and a new circuit is formed for the second armature winding starting from L^1 at Z^2, passing through A C^6, the switch P^2, wire A C^3, the second winding on the armature A, wire A C^4, to dial D. At the same time the controller brush C^1 leaves dial D^1 and makes contact with the dial D^3, inserting resistance in the shunt field winding at X to cause the armature still to run at 600 revolutions per minute, even though the windings have just been changed over from series to multiple.

Assume that the full field strength was 120 when the start was made and that in order to increase the motor speed from 100 to 600 revolutions per minute the field was reduced from 120 to twenty, or one-sixth of full strength. When the armatures were connected in multiple each one had to produce a counter electromotive force double that of which it did formerly; hence it was necessary to double the field strength; that is, to make it forty. With this field the armatures were turning at 600 and the press at sixty revolutions per minute. As the field strength can be reduced to 20, it is apparent that the motor speed can be increased to 1,200 and the press to 120 revolutions per minute.

For magazine web presses this range of speed to reach from threading to production would be ample, but is rather low for the web-press practice for newspaper work by the Hoe and Gauss presses.

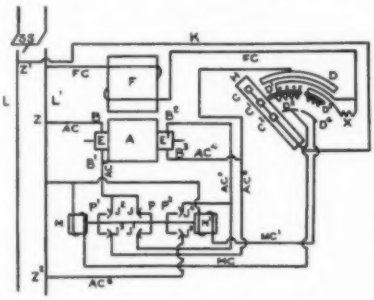


Diagram of Connections of Motor Controller.

It might be a better plan to use two separate motor armatures on one shaft with a third bearing in between the armatures, or a very heavy shaft with short armatures, instead of one armature and two windings.

If a larger range of speed than can be obtained with two windings or its equivalent must be had, a third armature could be added which would complicate the switching arrangements somewhat and make the motor longer, but these matters are trifling compared to the advantages to be gained. It is probable that a much larger range of field control than six to one could be obtained to enable two armature windings or armatures to meet the demand.

Above 20-horsepower capacity, a motor of 100 revolutions at full field would be pretty large to run at 1,200 revolutions per minute or higher. Moreover, such a motor would be expensive, hence, these are reasons for using two small motors instead of the larger one. For the very large web presses, two motors of two armatures each, the motors being geared or coupled together, might be the better plan. This should admit of start and change-over from series to multiple without armature resistance, and would make the engineering problem of field control much easier.

The absence of armature resistance, or a very small amount of it, is one novel thing about this plan of control. With the large-size motor equipments it might be found necessary to use one armature resistance point in starting and another at the point of changing from series to parallel, but there are good reasons for believing that there will be systems of web-press drive worked up on this plan in which armature resistance will not be necessary.

The print shop has been very wasteful of current in the past by using armature resistance, but the outlook is that the large range of speed variation required will be obtained without the nuisance of armature control.

Power Requirements.

The proper selection of a motor for driving any printing press is a matter which requires careful consideration. Any motor at any speed will not do. In order to obtain maximum efficiency the motor should be exactly the right size, the speed should be chosen with due regard to the operating conditions of the press, and the control should be such that the press can be operated at its maximum or minimum speed with the greatest efficiency.

An inexperienced man or one not fully familiar with printing-press requirements will invariably recommend a motor that is too large rather than one that is too small. He knows that a motor too small for the intended duty will give trouble from the outset, whereas one that is too large will only betray the fact by the amount of current it consumes. He will, therefore, always make a conservative guess. This certainly emphasizes the need of obtaining expert advice—as the printer is called upon the pay the bills, which increase in almost direct proportion to the size of the motor.

A motor develops its greatest efficiency when operating at or about full load. Great care should therefore be taken to chose a motor which will operate at approximately full-load rating when the press is operating at its maximum speed.

The majority of press manufacturers know what horsepower is required to drive their various sized presses, and several motor manufacturers have full data on this subject in their files. The accompanying tables, however, give the correct size motor for driving the presses mentioned. These tables have been compiled for direct-current only, and while the size of motor will be approximately correct for alternating-current service—yet the speeds given will vary considerably, and should not be taken as applying to alternating-current motors.

These tables hardly need any explanation. The size of the motor pulley has

(*Continued on page 940*)

DATA ON HORSEPOWER REQUIRED TO DRIVE

MOTOR RECOMMENDATIONS FOR MIEHLE PRESSES.

Press No.	Impressions Per Hour. Min.	Norm.	Max.	Press Pulley. Diameter.	Face.	Horsepower.	Revolutions per Minute.	Motor Pulley. Diameter.	Face.
00000	850	1415	1700	24	6	5	925	7.75	6
0000	850	1415	1700	24	6	5	925	7.75	6
00	730	1500	1800	24	6	3.5	965	7.5	6
1	900	1580	1900	24	6	3.5	965	8	6
2	1000	1665	2000	24	6	3.5	965	9	6
3	1000	1750	2100	24	6	3	1500	5.5	6
4	1125	1830	2200	24	6	3	1500	5 75	6
5	1285	1910	2298	24	6	2	1025	5.5	6
Pony 1	996	1845	2700	12	5	1.5	750	4	5

MOTOR RECOMMENDATIONS FOR CHANDLER & PRICE JOB PRESSES.

Press.	Size.	Impressions Per Hour.	Fly Wheel. Diameter.	Face.	Revolutions Per Minute.	Horsepower.	Revolutions Per Minute.	Motor Pulley. Diameter.	Face.
Eighth Medium...	7 by 11	2800	31.875	2	187	0.25	1800	3.25	1.25
Eighth Medium...	8 by 12	2600	33.75	2	173	0.25	1800	3.25	1.25
Quarto Medium...	10 by 15	2300	40.25	2.25	230	0.25	1800	5	1.25
Large Quarto.....	12 by 18	1800	42.125	2.25	210	0.50	1200	7.5	3
Half Medium.....	14 by 20	1500	42.125	2.25	200	0.50	1200	7	3
Half Medium.....14.5 by 22		1500	42.125	2.25	200	0.50	1200	7	3

MOTOR RECOMMENDATIONS FOR COTTRELL PRESSES.

Press.	Name.	Size.	Revolutions Per Minute. Min.	Nor.	Max.	Press Pulley.	Horsepower.	Revolutions Per Minute.	Motor Pulley. Diameter.	Face.
3	4 Roller—2 Rev	.....27 by 39	128	198	245	28 by 5	3	1500	4	5
5	4 Roller—2 Rev	.....33.5 by 46	147	220	267	28 by 5	3	1500	4	5
6	4 Roller—2 Rev	.....33.5 by 50	147	220	267	28 by 5	3.5	965	6.5	5
8	4 Roller—2 Rev	.....39 by 55	150	240	278	28 by 5	3.5	965	6.5	5
9	4 Roller—2 Rev	.....43 by 56	160	250	296	28 by 5.5	5	1350	5.25	5.5
10	4 Roller—2 Rev	.....43 by 62	160	250	288	28 by 5.5	5	1350	5.25	5.5
12	4 Roller—2 Rev	.....47 by 65	136	233	260	28 by 5.5	5	1350	5	5.5
13	3 Roller—2 Rev	.....50 by 74	136	212	265	28 by 5.5	5	1350	4.5	5.5
5	Flat Bed Perf	.....33.875 by 45	87	146	170	28 by 6	5	925	5	6
8	Flat Bed Perf	.....39.75 by 54	76	137	148	28 by 7	7.5	550	7	9
9	Flat Bed Perf	.....43 by 62	80	137	154	28 by 7	7.5	550	7	9
10	Flat Bed Perf	.....44.75 by 63	76	123	146	28 by 8	7.5	550	7	9
3	Monarch	....	100	125	150	24 by 4	1.5	750	4	4
5	Monarch	....	100	125	150	26 by 4	1.5	750	4.25	4
3	Triumph	....	100	125	150	24 by 4	1.5	750	4	4
5	Triumph	....	100	125	150	24 by 4	1.5	750	4	4
5	Paragon	....	100	125	150	26 by 4	1.5	750	4.25	4
6	Paragon	....	100	125	150	26 by 4	2.5	675	5	5.5
8	Paragon	....	85	110	130	28 by 5	5	375	8.25	5

MOTOR RECOMMENDATIONS FOR HARRIS AUTOMATIC PRESSES.

Press.	Revolutions Per Minute.	Press Pulley. Diameter.	Face.	Horsepower.	Revolutions Per Minute.	Motor Pulley. Diameter.	Face.
EI	600	10	3	0.5	1200	5	3
EI, with sheet feed	600	10	3	1	1100	5.5	3
EI, 2 color	600	10	3	0.75	1800	3.25	3
EI, 2 color sheet feed	600	10	3	1.5	1750	3.5	3
SIF	600	10	3	1.5	1750	3.5	3
SIF, 2 color	600	10	4	3	1500	4	4
S-4	788	8	4.5	5	1350	4.75	4
S-4, 2 color	788	8	4.5	7.5	835	7.5	6.5

MOTOR RECOMMENDATIONS FOR GOLDING JOB PRESSES.

Press.	Size.	Speed Max.	Speed Nor.	Speed Min.	Press Pulley.	Shaft Revolutions.	Horsepower.	Revolutions Per Minute.	Motor Pulley. Diameter.	Face.
6	8 by 12	2800	2100	1400	20	143	0.25	1800	1.625	2
7	10 by 15	2300	1750	1200	16	148	0.5	1200	2	3
8	12 by 18	1800	1400	1000	24	161	0.5	1200	3.25	3
9	15 by 21	1500	1150	800	18	135	1	515	4.75	4
18	12 by 18	1800	1400	1000	18	144	1	1100	2.5	3
21	15 by 21	1500	1150	1000	18	147.5	1	1100	2.5	3

MOTOR RECOMMENDATIONS FOR GALLEY UNIVERSAL PRESSES.

Press.	Size.	Speed Max.	Speed Min.	Press Pulley.	Shaft Speed.	Horsepower.	Revolutions Per Minute.	Motor Pulley. Diameter.	Face.
1	10 by 15	2600	1400	12	263	0.5	1200	2.625	3
3	10 by 15	2600	1400	18	271	0.75	1800	2.75	3
1	13 by 19	1800	1000	18	271	0.75	1800	2.75	3
1	14 by 22	1700	900	16	225	1.5	750	4.75	4
3	14 by 22	1700	900	18	253	1.5	1750	2.5	3

MOTOR RECOMMENDATIONS FOR SCOTT PRESSES.

Press.	Size of Bed.	Revolutions Per Impression.	Recommended Speed of Flywheel Shaft. Min.	Max.	Press Pulley.	Horse-Power.	Further Press Particulars.
C-1	17 by 22	4	107	172	14 by 4	1.5	Two-Roll—Drum
C-5	38 by 51	5	97	155	17 by 5	2	Two-Roll—Drum
C-6	33.5 by 47	5	87	140	17 by 5.5	2.5	Two-Roll—Drum
C-7	30 by 42	5	78	125	20 by 5.5	3	Two-Roll—Drum
D or DT-3	24 by 29	5.09	118	189	15 by 4	2	Two-Roll—Drum
D or DT-4	26 by 34	5	106	170	17 by 4.5	2.5	Two-Roll—Drum
D or DT-5	29 by 42	5.07	97	155	20 by 5	2.5	Two-Roll—Drum
D or DT-6	32 by 47	4.96	86	138	22 by 5.5	3	Two-Roll—Drum
D or DT-7	35 by 51	5.06	78	125	22 by 5.5	3.5	Two-Roll—Drum
E-2	21.5 by 25	6	208	332	16 by 4	2	Two-Roll—Drum
E-3	24.5 by 31	6.52	200	325	16 by 4	2.5	Two-Roll—Drum
E-4	27.5 by 36	7.56	208	332	18 by 5	3	Two-Roll—Drum
E-5	30.5 by 42	8.08	202	325	18 by 5	3.5	Two-Roll—Drum
HN or HF-4	26 by 36	7.4	184	296	18 by 5.5	6	Four-Roll
HN or HF-5	29 by 42	7.8	180	290	18 by 5.5	3.5	Four-Roll
HN or HF-6	33.5 by 46	8.06	170	274	22 by 6.5	4	Four-Roll
HN or HF-7	36.5 by 48	8.43	170	274	22 by 6.5	4.5	Four-Roll
HN or HF-8	40 by 52	8.81	170	274	22 by 6.5	5	Four-Roll
HN or HF-9	43.5 by 56	9.37	170	274	24 by 7.5	5.5	Four-Roll
HN or HF-10	47 by 62	9.75	170	274	24 by 7.5	6	Four-Roll
HN or HF-11	48.5 by 66	9.75	160	255	24 by 7.5	6	Four-Roll
M-2	38 by 51	5.33	170	274	24 by 5	5	Rotary
M-3	46 by 60	5.66	163	262	24 by 6	6	Rotary
M-4	46 by 70	5.66	163	262	24 by 6	6.5	Rotary

been calculated so as to give the most desirable speed of press. Any reasonable speed, however, can be obtained by simply changing the pulley on the motor or in some cases the pulley on the press.

Direct-Connected Motors for Linotypes.

One of the most interesting and important developments in the line of printing machinery, and one which has a very marked influence on newspaper and other publications, is that of the linotype. A great many attempts were made to set type mechanically before a commercially successful machine was finally brought out.

The machine as finally built is necessarily intricate in its design, and does not lend itself readily to the application of electric motors. This is primarily because of the slow speed of its main driving shaft. While the amount of power involved is quite small, the satisfactory application of a motor is difficult. The riveted frame construction is particularly adapted to cases of this kind, on account of its small size per unit of capacity.

The motor which has been recently developed for the direct application of linotype is so constructed that it can be assembled on the machine without doing a considerable amount of fitting.

The torque demanded of the linotype is variable. The distributing mechanism operates continuously, and requires a very small amount of power. It is only when the line of matrices is complete, and the cam motion is set in operation preparatory to casting the line of type, that there is any considerable torque demanded of the motor. Of course the flywheel effect of the motor armature geared directly to the main shaft of the linotype is of particular advantage during this momentary heavy torque demand. A comparatively small starting torque is required, as the machine is set in motion before the cam motion, requiring the major portion of the power, is tripped.

The motor is so designed that it can be wound for all commercial frequencies, phases and voltages. The polyphase machine is provided with a distributed polyphase field winding, and is started and operates in the ordinary manner.

The single-phase machine is provided with a split-phase winding consisting of two sections, only one of which is active when the motor has attained its full speed. The motor armature is arranged to slide laterally in its bearings a short distance, its core being displaced from the field in the starting position. Two brushes resting on a collector ring complete the circuit of the starting section of the motor winding. Upon closing the switch the armature is strongly repelled, and therefore held displaced from the field by reason of comparatively large currents developed in its squirrel-cage winding.

Electric Heating.

Electric heat is destined to play an important part in the printing field on account of the necessity for accurate control, speed and cleanliness. At present electric heat has been successfully applied to linotypes and monotypes, glue pots and matrix dryers.

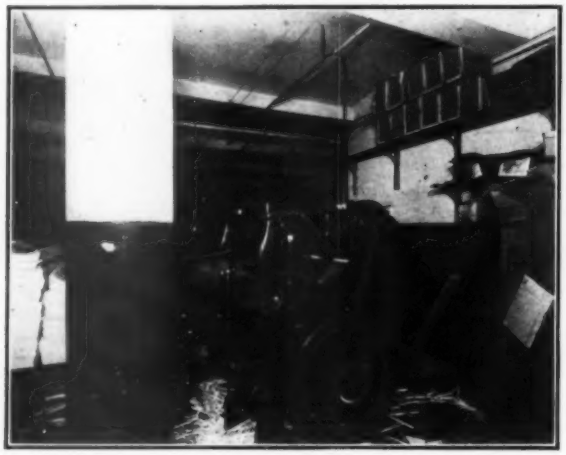
Electrically heated linotype pots have been used with success in a number of installations. At present they are only available for direct-current circuits, but it is stated that alternating-current heaters will soon be developed. The consumption of these heaters averages seven amperes, with a maximum consumption of 15 amperes and a minimum of 3.5 amperes, on 120-volt circuits.

Electrically heated matrix drying tables, as used in newspaper offices in the preparation of the matrices from which stereotype plates are cast, form one of the most successful examples of the application of electric heating apparatus to industrial work. In newspaper work the time element is of paramount importance. Every minute that can be saved in getting an extra or athletic edition on the streets after the news is received, means a better paper and additional sales. Hence the value of the electric matrix dryers, by means of which from three to five minutes can be saved on each page, over the the older steam drying process.

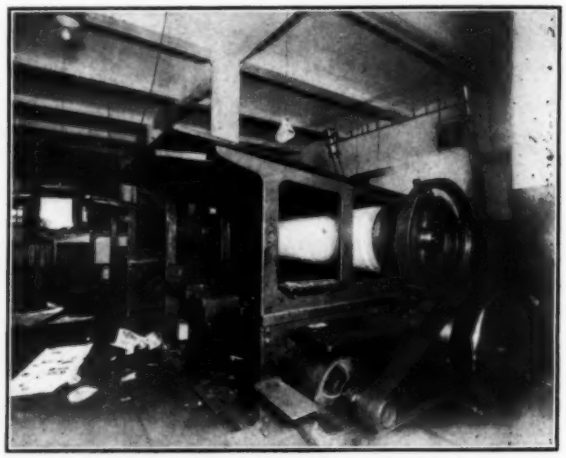
In the preparation of a newspaper page for the press, the first step is to obtain an impression on a mould or matrix of the type composing the form. To accomplish this, a damp, spongy sheet of material about one-sixteenth inch thick is placed over the form and this matrix is pressed onto the type and rapidly dried under a heavy pressure. The drier is composed of a flat bed in which are placed the electrical heating elements which raise the temperature of the drier, form and matrix to a high value. When completely dried, this matrix, carrying a faithful, clear-cut impression of the type, is removed from the drier and placed in the plate casting machine. Here are cast the semi-cylindrical plates which are to be mounted in the presses for the production of the paper.

When it is recognized that one matrix is commonly used for the casting of from four to a dozen plates and may at times be used for as many as 60 plates, it will be seen that it is of the utmost importance to obtain a perfectly uniform and dependable product; and this is made possible by the use of electric driers.

In the past it has been customary to operate the matrix presses by a hand wheel and screw, a slow and laborious process. The presses were heated to a working temperature by means of steam supplied under pressure from a main boiler plant or from a small, gas-heated steam generator mounted directly beneath the bed of the press. In either case a large amount of heat was liberated into the surrounding air on account of the large radiation surface of the massive construction necessary to withstand the steam pressure. Considerations of safety and economical design limit the pressure of



Motor-Driven Cutter.



Motor-Driven Presses.

Printing-Plant Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

San Diego Union, San Diego, Cal. Newspaper plant. Individual drive. Running hours per week, 35.

Total connected horsepower, 62.75. Number of motors installed, 15. Average kilowatt-hours per month, 1,183. Average kilowatt-hours per month, per horsepower connected, 18.8.

Kilowatt-hour consumption for 12 months: January, 1,200; February, 1,100; March, 1,100; April, 1,100; May, 1,100; June, 1,100; July, 1,000; August, 1,300; September, 1,200; October, 1,100; November, 1,200; December, 1,700.

Load-factor, 3.4 per cent; operating-time load-factor, 12.4 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power	Speed R. P. M.	Application.
1	2	1,800	Belted direct to one linotype.
1	1.5	1,800	Belted direct to one linotype.
5	0.5	1,800	Each belted direct to a linotype.
1	20	840	Belted direct to one Howe 16-page press.
1	20	1,200	Belted direct to one press (held in reserve).
1	5	1,200	Belted direct to one molding machine.
1	3	1,800	Belted direct to one tail cutter.
1	2	1,800	Belted direct to one shaving machine.
1	3	1,800	Belted direct to one saw and trimmer.
1	3	1,800	Belted direct to one jig saw.
1	0.75	1,200	Direct-connected to one ventilating fan.

Energy for this installation is supplied by the San Diego Consolidated Gas & Electric Company.

Kenfield-Leach Company, Chicago, Ill. This plant prints and publishes an aggregate of 92 periodicals and does a considerable amount of job work. Individual drive. Running hours per week, 96. (Two shifts working 48 hours per week each.)

Total connected horsepower, 81.75. Number of motors installed, 31. Average kilowatt-hour per month, 14,000.

Kilowatt-hour consumption for 6 months: November, 7,740; December, 11,060; January, 11,540; February, 10,890; March, 10,760; April, 14,250.

Load-factor, 24.8 per cent; operating-time load-factor, 32.4 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is 220 volts, direct current.

No.	Horse-power	Speed R. P. M.	Application.
1	2	1,100	Belted direct to a Seybold 34-inch paper cutter.
1	2	1,200	Belted direct to a Sheridan 34-inch (New Model) cutter.
6	0.125	940	Each direct-connected to a Monitor No. 2 wire stitcher.
1	2.5	1,100	Belted direct to Chambers Brothers 43 by 45-inch folder.
1	2	1,100	Belted direct to Chambers Brothers 44 by 62-inch folder.
1	3	1,250	Belted direct to Chambers Brothers 48 by 68-inch folder.
1	2	1,200	Belted direct to Chambers Brothers 48 by 62-inch folder.
1	4	1,150	Belted direct to Miehle 33 by 46-inch press.
1	5	1,200	Belted direct to Cottrell 25 by 38-inch press.
5	5	1,150	Belted direct to five Miehle 46 by 65-inch presses.
1	5	1,200	Belted direct to one Miehle 43 by 56-inch press.
1	5	1,150	Belted direct to one Miehle 44 by 65-inch press.
1	5	1,150	Belted direct to one Miehle 43 by 62-inch press.
2	5	1,100	Belted direct to two Miehle 46 by 62-inch presses.
2	7.5	975	Belted direct to two Miehle 46 by 68-inch presses.
1	1	1,200	Belted direct to one National 18 by 22-inch job press.
1	1	1,200	Belted direct to one Chandler & Price 12 by 18-inch job press.
2	0.5	1,650	Belted direct to two 10 by 15-inch Chandler & Price job presses.
1	3		Belted to line shaft driving 10 Mergenthaler linotypes.

Energy for this installation is supplied by the Commonwealth Edison Company.

Oklahoma Specialty Printing Company, Oklahoma City, Okla. Does a job-printing business. Combination drive. Running hours per week, 56.

Total connected horsepower, 2.5. Number of motors, 4. Average kilowatt-hours per month, 58.

Kilowatt-hour consumption for 12 months: January, 10; February, 59; March, 53; April, 68; May, 55; June, 70; July, 95; August, 68; September, 72; October, 75; November, 65; December, 11.

Load-factor, 4.2 per cent; operating-time load-factor, 12.7 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The motors are 110-volt single-phase machines.

No.	Horse-power	Speed R. P. M.	Application.
1	0.5	1,800	Belted direct to one 8 by 12-inch Chandler & Price job press.
1	0.5	1,800	Belted direct to one 10 by 15-inch Chandler & Price job press.
1	1	1,800	Belted direct to 13 by 19-inch Chandler & Price job press.
1	0.5	1,750	Belted direct to one sewing machine.

Energy is supplied by the Oklahoma Gas & Electric Company.

Printing-Plant Data—Sheet No. 2.

Newspaper and job printing plant, name withheld. This plant publishes a daily evening and bi-weekly paper and in addition does job printing. The evening paper has a circulation of 4,600 copies. Group drive. Running hours per week, 60.

Total connected horsepower, 39. Number of motors installed, 12. Average kilowatt-hours per month, 731.

Kilowatt-hour consumption for 11 months: January, 679; February, 970; March, 673; April, 796; June, 678; July, 553; August, 749; September, 643; October, 693; November, 753; December, 856.

Load-factor, 3.4 per cent; operating-time load-factor, 7.6 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. All motors are three-phase, 60-cycle, 220-volt, induction machines.

No.	Horse-power	Speed R. P. M.	Application.
1	7.5	1,080	Slip-ring motor connected by a Morse five-inch chain to the drum of an Otis 1,000-pound freight elevator.
1	0.333	1,120	Single-phase motor belted by three round belts to a Mergenthaler linotype.
4	0.5	1,700	Each belted to a countershaft, then to 14-inch pulley on Mergenthaler linotype.
1	15	1,120	Belted to a 15-foot shaft (four hangers) and a two-hanger countershaft driving one R. Hoe & Company No. 3 Webb printing press, capacity 8,500, 16-page papers per hour, (operates one-half hour four days per week and one hour two days); one Hoe plate planer, 25-inch blade, pulley 16-inch diameter; one Wessel six-inch circular metal saw, pulley, seven-inch diameter; and one Hoe tail cutter, 33.75-inch plates, six-inch pulley.
1	3	1,700	Belted to a four-foot, two-hanger shaft driving one Hoe rolling machine, 32 by 27.5-inch plate, eight-inch pulley.
1	0.5	1,700	Belted to a Mergenthaler linotype.
1	3	1,700	Back-geared and belted to a Child Acme cutter, 42-inch blade.
1	7.5	1,120	Belted to a 35-foot shaft (eight hangers) and four two-hanger countershafts driving one Miehle No. 4, 29 by 41-inch cylinder press, capacity 2,100 impression per hour; one Babcock Pony Optimus, 26 by 32-inch cylinder press, capacity 3,000 impressions per hour; one J. Thompson Style 5, 14 by 22-inch job press; one J. Thompson Style 2, 14 by 22-inch job press; two Chandler & Price 10 by 15-inch job presses; one Peerless 11 by 18-inch job press; and one Dexter 12 by 16-inch to 32 by 44-inch jobbing folder.
1	0.166	1,100	Single-phase motor geared to a Monitor No. 1 wire binder.

Energy is supplied by the Edison Electric Light & Power Company, Amsterdam, N. Y.

The Franklin Press Company, Pueblo, Colo. General printing and lithographing. Combination drive. Running hours per week, 98. (Average.)

Total connected horsepower, 31. Number of motors installed, 16. Average kilowatt-hours per month, 1,074. Average kilowatt-hours per month per connected horsepower, 34.6.

Kilowatt-hour consumption for 12 months: January, 1,794; February, 1,511; March, 1,056; April, 951; May, 624; June, 691; July, 720; August, 845; September, 917; October, 1,536; November, 1,071; December, 1,171.

Load-factor, 7.4 per cent; operating-time load-factor, 8.5 per cent. Motors are 500 volt direct-current.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives.

No.	Horse-power	Speed R. P. M.	Application.
1	1	1,200	Belted direct to one rotary auto press, 11 by 17 inches.
1	5	1,800	Belted direct to one 39 by 52-inch cylinder press.
1	3	1,800	Belted direct to one 28 by 42-inch cylinder press.
1	4	1,950	Belted direct to one 36 by 50-inch cylinder press.
1	3	1,800	Belted direct to one 36-inch paper cutter.
1	1	1,300	Belted direct to one folding machine.
			Belted direct to one 36-inch Seybold paper cutter.
1	3	1,200	Belted direct to a line shaft driving two wire stitchers; one paper perforator; one paper punch; one Singer stub sewing machine, and one ruling machine.
1	7.5	1,650	
1	0.125	1,180	Belted direct to one numbering machine.
1	0.25	700	Belted direct to one ruling machine.
1	1	1,400	Belted direct to one 15 by 18-inch Platen press.
1	0.5	1,480	Belted direct to one 12 by 15-inch Platen job press.
2	0.5	1,800	Each belted direct to one 8 by 12-inch Platen job press.
1	0.25	1,800	Belted direct to one 12 by 15-inch Platen job press.
1	0.5	1,480	Belted direct to one 12 by 15-inch Platen job press.

H. C. Boyeson Company, St. Paul, Minn. Individual drive. Running hours per week varies.

Total connected horsepower, 8.75. Number of motors installed, 8. Average kilowatt-hours per month, 351.

Kilowatt-hour consumption for 12 months: January, 310; February, 270; March, 270; April, 320; May, 370; June, 310; July, 330; August, 450; September, 430; October, 410; November, 360; December, 390.

Load-factor, 8.6 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. Supply source is direct current.

No.	Horse-power	Speed R. P. M.	Application.
1	1	1,350	115-volt motor belted direct to one 10 by 15-inch Colts Armory press.
1	1	1,500	115-volt motor belted direct to one 10 by 15-inch Colts Armory press.
1	5	1,850	220-volt motor belted direct to one No. 3 Miehle four-roller press.
3	0.25	1,500	110-volt motors, each belted direct to one small job press.
2	0.5	1,500	110-volt motors, each belted direct to one 10 by 15-inch Colts Armory press.

the steam to 80 pounds per square inch, corresponding to a steam temperature of 320 degrees Fahrenheit. A matrix may be dried by this method in from 4.25 to 12 minutes, depending upon the amount of open space in the forms and the quality of the absorbing pads. By substituting compressed air for the hand wheel, a quick certain pressure is obtained, which can be definitely fixed at any desired value and which remains constant during the whole drying operation. Control of the pressure is obtained by means of an easily operated air valve. By the use of electric heaters a higher temperature can be secured than with steam, the melting point of the type metal being the only temperature limit, and thus the drying process can be completed in a much shorter time than is possible with steam. Perfect matrices are obtained with the electrically heated presses in from 1.25 to 3 minutes.

The following are the results of tests made on electrically heated driers installed by the *Pittsburgh Press*. There are four presses in this set, each press being independently controlled and taking a minimum of 1.1 kilowatts and a maximum of 13.5 kilowatts.

The results of the test are as follows: (1) The minimum time required for the production of a satisfactory matrix was one minute, 15 seconds. (2) The total number of kilowatt-hours required in an 8-hour day for varying numbers of matrices was 200, a working temperature being maintained throughout the entire day. (3) The total amount of energy required for a period of seven days to produce 270 matrices for the various editions of the paper, including one Sunday morning edition, was 1,050 kilowatt-hours.

Similar tests on an installation of four gas-heated steam tables of approximately the same output give the following results: (1) The minimum time to produce a matrix was four minutes, 15 seconds. (2) The natural gas consumption for a period of seven days was 12,300 cubic feet. Aside from the saving in time, it should be noted that the average amount of heat liberated per day by the electric presses is approximately 500,000 British thermal units, as compared with 1,750,000 British thermal units for the same time by the gas-heated tables. The lesser amount of heat results, of course, in a very appreciable reduction in the temperature of the work room.

With gas costing $1.00 per thousand cubic feet and electricity at 1.25 cents per kilowatt-hour, the power costs would be approximately equal. In an application of this kind, however, the saving of time and the simplicity of control, as well as the general operating convenience, are of such importance as to entirely overshadow considerations of operating costs.

Lighting.

It is doubtful if there exists another industry in which good lighting has a greater effect on the successful operation of the plant than is the case in the printing office. In the press room, for high-speed rotary presses powerful lamps giving good diffused general illumination are preferred, supplemented in the interior of the press by additional lighting usually obtained from incandescent lamps. The general illumination of the press room must be good and as free from deep shadows as possible. Not less than 2.5 foot candles is anywhere satisfactory for a high-speed rotary press. Flat-bed presses are quite simple to light, and require an average illumination of about five foot-candles on the working plane.

Linotype machines require good illumination on the copy, less on the keyboard, and very powerful illumination on the matrices just before they reach the casting box. Specially designed reflectors are designed for this service.

Commercial Practice
Management, Rates, New Business

Billboard Chart.

Although it is conceded to be difficult to present an elaborate argument on a billboad or painted wall space, the Kentucky Electric Company, of Louisville, Ky., has used this method successfully in demonstrating the fact that electricity is not to be included in the list of commodities affected by high-cost-of-living influences. The company has secured one of the largest wall spaces in the city, and on this has been painted a large chart, showing graphically how the price of current has fallen since the company entered the field five years ago. The chart requires some study in order for the points to be apprehended, but as it looks something like a baseball score-board, many "fans" stop to find out how the game is going and before they know it have absorbed the arguments of the company about the economy of using electricity.

It is estimated that in Asia there are about 170,000 telephones, mostly in Japan. The number in Singapore exceeds 1,000, and there are about as many in Siam and Cochin China.

A Successful Central-Station Campaign.

It is no small undertaking to electrify a single building, even under favorable conditions, and the man who would undertake, and carry to successful completion, the electrification of a city of 2,100 people must be energetic, resourceful and well trained. Such a man is George Edward Johnson and the city to which he first applied his principles is Sabetha, Kans.

The lighting plant at Sabetha, when Mr. Johnson took charge, had been operating under municipal direction, and at a loss, for nine years. With a definite idea in mind and with carefully thought out plans he set about reorganizing and improving the central-station service. How well he has succeeded may be appreciated from the fact that out of the total 700 houses in the place, 600 are taking current and use in the aggregate 7,000 lamps. In the stores, factories and houses there are also 600 motors in use, driving every conceivable appliance.

The first great work of putting the plant on an efficient and business basis was successfully accomplished at an outlay of $8,000, devoted mainly to new and modern apparatus, and the task then presented itself of building up an adequate consumer load that would tax the capacity of the machines. The most important step was, after the introduction of the electric light into a major portion of the homes and factories, the application of the electric motor to the various power uses of the city. The city itself led the way by installing a complete equipment of electric motors to drive all its pumps and furnish its entire water supply. All the water the citizens use is also obtained by electric pumps, and at most reasonable rates.

These motors were situated in small buildings and were direct-connected to the pumps. They receive no other attention than oiling twice a week, and were started and stopped by switches at the power house 500 feet away. This installation is illustrated in Fig. 2, where will be seen the two centrifugal fire pumps and the centrifugal pump for regular service. The fire pumps have a capacity of 400 gallons and are driven by forty-horsepower single-phase Wagner motors. The regular pump is driven by a 15-horsepower motor, and

like the others is coupled directly to the motor shaft. Considerable doubt was expressed regarding the ability of the single-phase motors to start the pumps under full load and bring them up to speed, but no difficulty of this sort has been experienced.

So satisfactory was the city's venture that motors of that type were soon installed wherever the need for power existed, and only a short time ago the last gasoline-engine power plant was sold and the money used to buy an electric motor. In showing the superiority of the electric motor over the gasoline outfit it is interesting to refer to Fig. 2. This shows the interior of the Metz Lumber Mill in Sabetha, where will be seen a single-phase 15-horsepower motor running the entire shop. Before the coming into general use of electricity through the availability, cheaper rates, and 24-hour service which Mr. Johnson had brought about, the power had been supplied to the saws, planers, lathers, etc., by a 20-horsepower gasoline engine. The electric motor, of less capacity, is now carrying the same load at a saving of about 20 per cent.

In connection with the central-station end of this particular service it was found advisable from several standpoints to connect the single-phase motor to the same bank of transformers that supplied current for lighting to several blocks of business houses. Not the slightest trouble has been met from flickering of lights when starting this motor.

Mr. Johnson, having gotten the larger users of current started in the right direction, went after the grocers, carpenters, butchers and other trades people in the city, and also after the farmers in the outlying districts. It was in one of these latter campaigns that the Sabetha plant secured as a customer the entire town of Morrill. Practically all the store-keepers in Sabetha use electricity and reap the consequent advantages. Fig. 3 gives a good idea of the way the grocer in Sabetha grinds his coffee, the picture having been taken in the store of Mr. Newman, who was one of the first to take up the new labor-saving electric motor. Now every grocer has one or more! Wherever one goes about the town one sees evidences of Mr. Johnson's work in proving to the people the economy in the use of electricity. Even the small and unpretentious carpenter shop seen in Fig. 4 has its motor. This shop is some distance out of the city and the single-phase motor is connected to the same transformer that carries the lights of a number of dwellings, but no disturbance is noticeable on these lines when the motor is started.

The next and final step in electrification was the introduction of current devices other than lamps into the homes of the city. Mr. Johnson, with the co-operation of Mrs. Johnson, a graduate engineer by the way, equipped their house with every modern electrical device that could be obtained, and aside from the regular use of the various appliances, gave special demonstrations of the more popular pieces

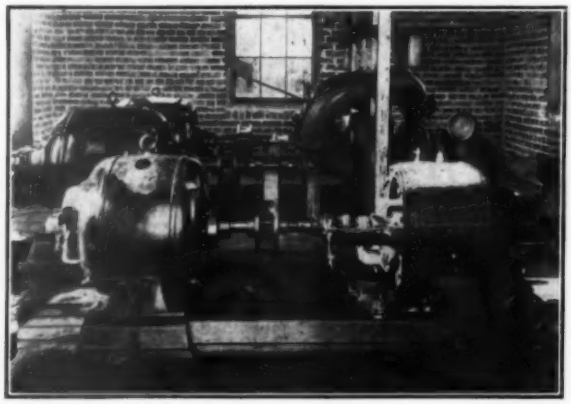


Fig. 1.—Motor-Driven Pumps.

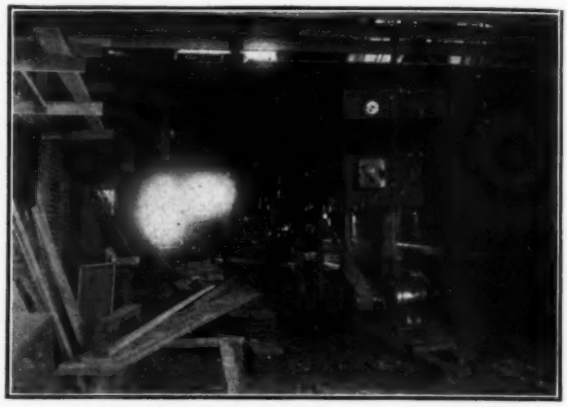


Fig. 2.—Motor Driving Woodworking Machines.

Fig. 3.—Motor-Driven Coffee Grinder.

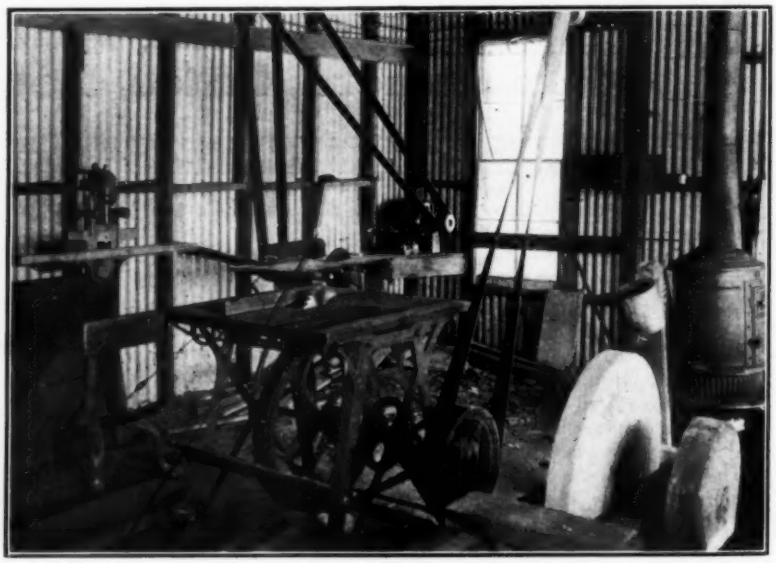


Fig. 4.—Motor Drive in Carpenter Shop.

such as flat-irons, fans, washing machines, curling irons, etc. It was not long before a demand was worked up for these handy household current-consuming devices, and again, in turning the demand into actuality, Johnson shone. He bought direct from the manufacturers in wholesale quantities and at wholesale prices these devices, and sold them at low prices, yet with a fair margin of profit to the central station. Today few of the houses have not one or more "electric servants" and some have quite an equipment, including churns, sewing machines and a set of electrical cooking appliances.

Finding that he still had some steam to spare even at the peak of the load and that lots went to waste in the exhaust pipe, lines were laid, radiators bought at wholesale, and the city homes are now users of central-station steam heat as well as current. The probability is that electric heating will soon come into vogue. There still being some exhaust steam to spare, arrangements were made to sell it to a big laundry and to an ice plant, so that they would use not only the electricity the plant made, but also the steam it would ordinarily have wasted. Other cities have become curious of Sabetha's electrification and Mr. Johnson's services are in demand in that section of the country.

The whole story goes to show what can be done by an efficiently run central station with energetic officers to push the sale of current-consuming devices that themselves prove, in a short time, their worth.

Standardizing Electric-Motor-Service Arguments.

In submitting propositions for electric power service to manufacturers it is usually desirable to accompany any extended report or letter with certain important general arguments in addition to the discussion of details which are highly specific in character. As the various reports and propositions go to many different users of power the same material can frequently be pressed into service many times without in the least detracting from its value. An example of this practice is given in the following extracts drawn in the main from a typical power-cost report of a central-station organization in the East which goes to great pains to supply the prospective consumer of its service with detailed costs and arguments displaying the benefits of electricity as a motive power. Every central-station man knows these points almost by heart, but in a great many instances the prospective consumer finds fresh and unsuspected interest in them. Great care was taken to draw up the arguments in simple, clearly expressed language, and they are given here in the belief that they will have at least a suggestive value to central stations which are trying to reach their power prospects systematically and effectively.

Motor Efficiency and Capacity. The electric motor is very efficient and consumes power only in proportion to the load it is called upon to deliver. The friction and electrical losses in the motor, when operating, are small and are entirely eliminated when the machine is stopped. It is always ready

George Edward Johnson,
Successful Central-Station Manager.

to do work and will do so greatly beyond its normal capacity for a reasonable time. It will deliver power for short periods largely in excess of its rated capacity without damage and at approximately the same efficiency as when normally loaded.

Flexibility. The plant of the Blank Company (the manufacturing establishment under consideration) consists of several floors and the subject of power distribution presents a serious problem. With the present system of distribution, small quantities of power are carried long distances by means of shafting and belts. It is evident that in several instances more power is lost by transmission than is used by the machines. It is estimated that in some instances if electric motor power were substituted for the present drive, the bill for power would be less than the present cost of belt and pulley maintenance.

Overtime. Overime operation may be easily carried on with economy if electric motors are connected to the machines, as power is only consumed when the machines are in operation. It is not necessary to run all the shafting to operate any department overtime if electric power is installed.

Constant Speed Increases Production. Motors connected to machines increase their productive capacity depending upon the kind of machine and the class of material being worked.

Readiness to Start. With central-station service there are no preliminary operations such as raising steam, starting engines, or any of the many necessary tasks to get a steam plant into commission. The motor driven from central-station service is always ready and may be started by the simple turning of a switch.

Overtime Efficiency. If it is necessary to run a few machines for overtime work, these may be run at maximum economy because the operating machines are the only ones affected when power is purchased from the central station. With a steam plant it would be necessary to run the plant overtime, and with a very small load-factor a low operating efficiency results.

Continuity of Service. Elaborate precautions are taken by the central station to assure a continuous supply of current during every minute of the 24 hours. By reason of the high engineering skill employed in the central-station plant, the likelihood of a shutdown is of a very remote nature.

First Installation and Future Extensions. In laying out the first installation of electric motor drive it is not necessary, if power is purchased from the central station, to take into account the possibility of a greater future demand for power as would be necessary if a private plant were installed. The central station will take care of this item. If business should increase, requiring the use of more power, it is only necessary to purchase new machines and motors for driving them. The question of power need not be considered except to advise the central station of the increased demand.

Electrical versus Mechanical Drive. It is a well known fact that mechanical drives, even if well laid out, have been supplemented by the electric method of power distribution, and a substantial saving in power has been made. Savings have been made even in cases where the losses in the electrical system seemed to be as great as the no-load friction losses in the mechanical drive, a result that indicates an increase in friction in a system of shafting and belting when transmitting the load.

Light and Cleanliness. With the motor drive there are practically no belts and consequently no obstructions to light. The dirt which rapidly moving belts always agitate is absent, and the ceilings and walls may always be kept clean, thus better reflecting the light. It is a well known fact that better work can be done in daylight than at night, so also can the best work and the greatest quantity be done in a well-lighted, ventilated and clean factory.

Electrical Construction

PREVENTION OF THE THEFT OF CURRENT.

By George L. Forest.

With the more general education of laymen on electrical subjects through advertisements, newspaper and magazine articles, etc., the attitude of mystery once assumed by the majority of people toward anything electrical is being dispelled very rapidly, and with the result that the knowledge of simple-circuit wiring is becoming common to all classes.

This fact should lead all wide-awake central stations to devise and promote means to protect service entrances in such a manner that the theft of current by any person so inclined would be practically impossible, without ultimate detection. While there are various patented devices on the market for this purpose, in the writer's view this object can be attained by a few simple methods applicable to the ordinary or standard installation, and with a measure of success fully as great.

Many and ingenious are the methods used to defraud central stations. To show what means are sometimes used, two cases are cited below which have come to my attention, where the consumer by attaching to exposed and accessible service wires before these went through the meter managed, by manipulating switches, to defraud the company of considerable revenue.

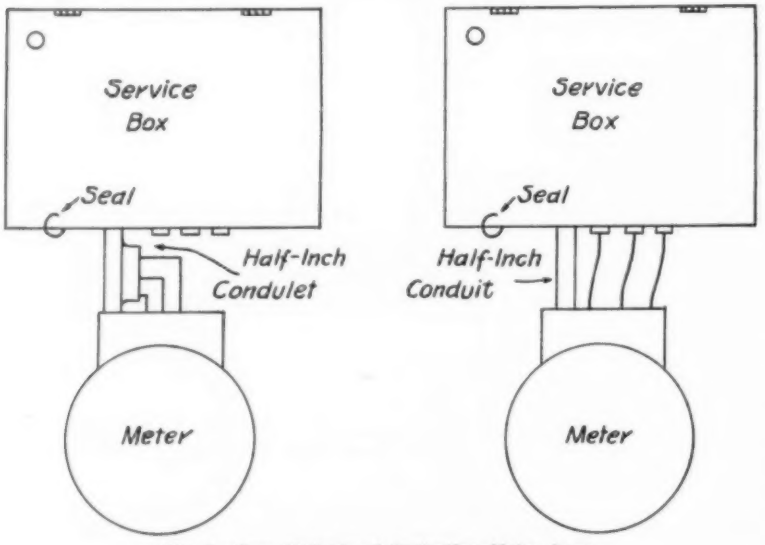


Fig. 1.—Two Methods of Protecting Meter Loop.

In one case the consumer had installed a door switch in the panel of a door opening into a dark closet where the meter was located. The wiring was simply an extension of the pressure tap to the meter and was so arranged that upon opening the door the tap to the meter was connected through the switch, and the meter registered normally. Opening the door and leaving same open was necessary in this case when reading the meter, on account of there being no artificial light in the closet. upon closing this door the wire was disconnected and current consumed in the house was not measured. The practice in this case seemed to be to allow the door to remain open for a certain portion of each month, and in this way the theft of current was concealed for a time.

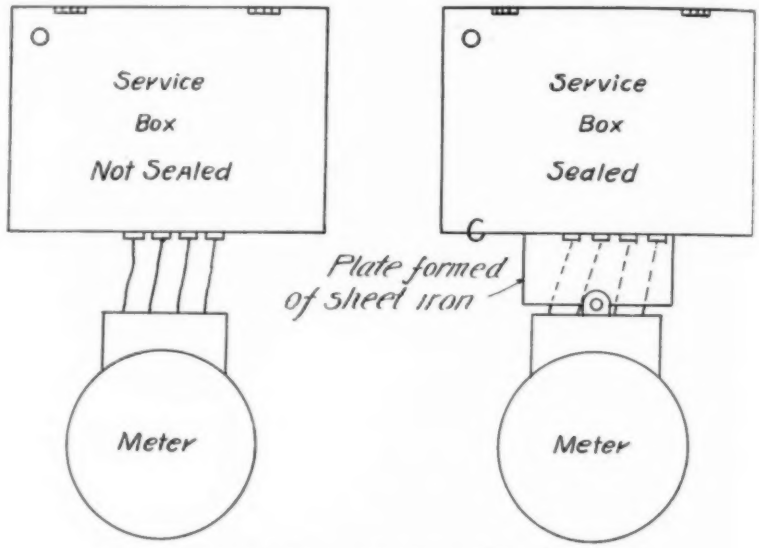


Fig. 2.—Ordinary Installation and Another Way to Protect Loop.

Suspicion was finally aroused, however, by the extremely low electricity bills and also from the fact that the number of rooms and the size of the residence seemed to justify a greater current consumption. Meter tester's reports as to the accuracy of the meter were always satisfactory. The door switch mentioned was accidentally discovered during one of these tests.

In another instance a business man well thought of and operating a public place of entertainment, whose monthly bills did not seem to come up to the actual consumption of current, was suspected of tampering and a check meter was therefore installed on an adjoining roof. In this way the actual current consumption became known. The party was confronted with evidence of his perfidy and readily consented to a prorating of his bills covering a period of

six months back, promising also not to repeat the performance.

This other was a case where service wires were readily accessible and the consumer had installed in an out-of-the-way place a switch to operate as in the first case.

It seems that there should be no logical reason why a consumer should have access to the main service wires before they have entered the meter. In case of trouble, the average person will not attempt to replace fuses, etc., but will notify the service company or trouble man; so obviously there should be no objection to sealing the service box.

With one exception, the accompanying illustrations suggest practical methods of sealing both service box and meter. In Fig. 2 an ordinary installation is shown, in which the service box is not sealed and the wires are easily accessible. The same figure shows meter wires protected by a box of sheet iron, fastened under the meter screw, which makes the meter loop inaccessible.

Fig. 1 shows the phase wire run to the meter in conduit. In one of the two cases illustrated here the additional wires of the meter loop are brought out through a condulet and in the other these are run straight through from the service box. In Fig. 3 the use of an extra box large enough to contain the service fuses is shown. This box should be sealed by the central station. The lower right-hand portion of Fig. 3 shows the meter loop inside a sealed box, through which the service conduit is carried. This is really a modification of the other method suggested in the same figure.

The insertion of a clause in the application for service whereby the central station reserves the right to keep the service box sealed while connected to its service mains, can easily be accomplished and would work no hardship on the consumer, owing to the fact that if a fuse should be blown inside of a service box this is sufficient evidence that something is radically wrong and should require the attention of the trouble man.

While the majority of offenders in the matter of current theft are eventually apprehended, to be sure, the fact remains that the loss to a central station of fair size due to dishonesty of this sort is an item that is well worth serious attention and is rapidly increasing in amount, due to the average person becoming more familiar with the practical use of electricity.

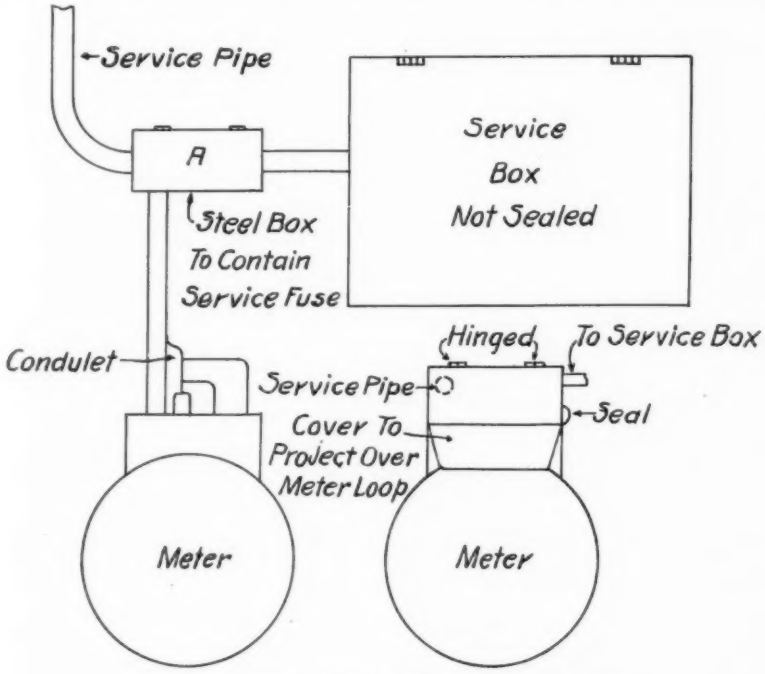


Fig. 3.—Two Other Methods of Safeguarding Meter Loop.

Electrical Equipment for Dredges.

The following interesting rules governing electrical installations on dredges have just been adopted by the Board of Fire Underwriters of the Pacific. The rules were prepared by C. W. Mitchell, who is inspecting engineer for the Pacific Board.

Electric Service.

(*a*) Service cable must not enter boat.

(*b*) At point where cable comes on board, an automatic oil switch or fuses must be arranged so as to cut off all power except as provided for hereafter. These fuses must not be of the open-air type, and either fuses or switch must be inclosed in a metal cabinet of the type specified for oil switches.

(*c*) In lieu of (*b*) open-air switches may be placed on the pole on shore where cable connects to transmission line.

(*d*) A separate cable may be run from the transformers for the fire pump motor to the pole line on shore. This cable must be connected to the transmission line ahead of the other service cable to the boat and must not have more than one set of fuses or one automatic oil switch between the transformers and the transmission line. These fuses or the switch should be on the boat near the transformers. Unless separate cable is run as above then the fire pump transformer primaries must be connected to the service mains on board the boat and ahead of the main automatic switch or fuses.

Transformers.

(*a*) Lighting transformers must be placed on the outside, hung on a framework erected near edge of boat on roof deck. Deck just under transformers should be covered with sheet iron not less than No. 16 U. S. gauge in thickness. Lighting transformers may be connected to main service ahead of main service fuses or switch. Fuses must be installed between the lighting transformers and the main service.

(*b*) Power transformers must each be set in a receptacle made of sheet iron or steel not less than No. 12 U. S. gauge in thickness and having a capacity, exclusive of transformer which is to be set in it, of one-third the capacity of the transformer. Each receptacle to be provided with a three-inch drain pipe extending down twelve inches under the surface of the water. Receptacles and transformers to be set in an enclosure made of sheet iron and half-inch approved asbestos wood. Floor of this inclosure to be of quarter-inch (No. 3 U. S. gauge) sheet iron resting on I-beams which raise it at least three inches above the deck. Sides and top of inclosure to have No. 12 U. S. gauge sheet iron on the outside riveted to one-inch I-beams placed eighteen inches on centers and asbestos wood on the inside riveted or bolted to the same I-beams. Space between sheet iron and asbestos wood to be filled with asbestos wool fibre. The side of inclosure toward outside of boat shall be hinged at top and arranged to open out, being held open by means of a rope and fusible link, the link being placed inside of and near the top of inclosure. This door shall not extend nearer than six inches to the bottom of the inclosure. All joints to be well made and door to close against a rabbet and lock automatically so that when it is shut the inclosure will be practically air tight.

(*c*) Fire pump motor must not take current from the general power transformer, but from transformers having a separate service. If not too heavy, the transformers for fire pump motor shall be placed on the outside, hung on a framework erected near the edge of the boat on the roof deck. Deck just under transformers should be covered with sheet iron not less than No. 16 U. S. gauge in thickness. These transformers may be placed on the side of the boat opposite that on which the lighting transformers are hung. If transformers are too heavy to be installed as above, they may be placed on main deck but need not be inclosed as required for other power transformers, because of the fact that they will have a load upon them only when the fire pump is in service.

Oil Switches and Autostarters must

be inclosed in practically air-tight inclosures rigidly constructed of sheet and angle iron. Where longest dimension is less than two feet the sheet iron must be at least as thick as No. 14 U. S. gauge; for larger inclosures, metal at least as thick as No. 12 U. S. gauge must be used.

Wiring.

(*a*) All wiring and electrical apparatus must be installed in accordance with requirements of the National Electrical Code.

(*b*) All conductors carrying current at a potential over 550 volts must be lead-covered cable in approved metal conduit, and must be kept outside the boat wherever possible.

(*c*) If current for bells is taken from lighting or power circuits, then approved bell-ringing transformers must be installed.

Computing Motor Leads.

The following useful data concerning leads for motors are taken from the rules of the Department of Electricity of Kansas City, Mo. It is believed that that part of the data which relates to induction motors will be especially helpful to contractors and wiremen.

The leads of branch circuits for motors are required to be designed to carry a current at least 25 per cent for direct-current, and 50 per cent for alternating-current motors, greater than that required for the full rated capacity of the motor.

Feeder circuits to operate one or more motors must be computed for the aggregate full-load capacity of all the motors and in no case must the feeder be less than 25 per cent in excess of the capacity of the largest direct-current motor, and 50 per cent in excess of the capacity of the largest alternating-current motor.

The method recommended for finding the size of wire for carrying a given load is substantially as follows.

In the case of a load of incandescent lamps or a direct-current motor the current, in amperes, is multiplied by the distance one way in feet and the result is divided by the allowable loss of volts in the line. The quantity obtained by this multiplication and division is then referred to Table No. 1, where that value of the constant *K* is chosen which is nearest the value of the quantity mentioned. Then by following the horizontal line in which this value of *K* appears across to the third vertical column from the right-hand side of the table, the proper size of wire is found. A case is assumed for illustration in which 50 amperes is to be delivered to a lamp load 180 feet from the source of power, with a line loss of 3 volts. By multiplying 50 by 180 and dividing by 3, the result obtained is 3,000. The value of *K* nearest 3,000 is 3,073, and the wire size in the horizontal-wire line with this quantity is a No. 2. A No. 2 wire is suitable for the installation assumed.

For alternating-current work, the instructions are to proceed as with direct current, but to multiply the quantity obtained by dividing the product of amperes and distance by volts lost by the right one of the numbers given below.

For two-wire single-phase, multiply by 1.05; for four-wire two-phase, multiply by 0.53; for three-wire three-phase multiply by 0.61. The number resulting from this multiplication is referred to the column of values of *K*. For instance, in the example given, if there had been three-phase alternating current instead of direct-current, the quantity carried to the table would have been 0.61 times 3,000 instead of the number 3,000 itself.

WIRING TABLE NO. 1.

Ohms per 1000 Feet	Area in Circular Mils	Diameter in thousandths of an inch.	B. & S. Gauge Number	Ampere Capacity, Rubber-Covered Wire	Constant (K)
.01035	1000000	1.000	....	650	46296
.01294	800000	.894	....	550	37036
.01726	600000	.775	....	450	27776
.02071	500000	.707	....	390	23148
.02590	400000	.632	....	330	18518
.03450	300000	.548	....	270	13888
.04893	211600	.460	0000	210	9800
.06170	167800	.410	000	177	7770
.07780	133100	.365	00	150	6160
.09811	105500	.325	0	127	4890
.12370	83690	.289	1	107	3870
.15600	66370	.258	2	90	3073
.19670	52630	.229	3	76	2437
.24800	41740	.204	4	65	1933
.3128	33100	.182	5	54	1533
.3944	26250	.162	6	46	1215
.6271	16510	.128	8	33	764
.9972	10380	.102	10	24	480
1.586	6530	.081	12	17	302
2.521	4107	.064	14	12	190

Table 2 is used for finding the amperes required by motors of various sizes and types. Single-phase induction motors above 10 horsepower have no values given, since the use of machines of this type in the larger capacities is not now very general.

TABLE NO. 2.—CURRENT REQUIRED BY MOTORS.

Horse-power.	Direct-Current Motors — Total Amperes			Alternating-Current Motors—Amperes Per Phase — Single-Phase			Two-Phase (Four Wire)			Three-Phase (Three-Wire)		
	110 Volts	220 Volts	500 Volts	110 Volts	220 Volts	440 Volts	110 Volt	220 Volts	440 Volts	110 Volts	220 Volts	440 Volts
1	9	4.5	2.0	14	7	3.5	6.4	3.2	1.6	7.4	3.7	1.9
2	17	8.5	3.7	24	12	6	11	5.7	2.9	13	6.6	3.3
3	26	13	5.6	34	17	8.5	16	8.1	4.1	19	9.3	4.7
5	40	20	8.8	52	26	13	26	13	6.5	30	15	7.5
7.5	60	30	13	74	37	18.5	38	19	9.5	44	22	11
10	76	38	17	94	47	23.5	44	22	11	50	25	12.5
15	112	56	25	....	....	....	66	33	16.5	76	38	19
20	150	75	33	....	....	....	88	44	22	102	51	25.5
25	188	94	41	....	....	....	111	55	28	129	64	32
30	226	113	50	....	....	....	134	67	33.5	154	77	38.5
40	302	151	66	....	....	....	178	89	44.5	204	107	53.5
50	368	184	81	....	....	....	204	102	51	236	118	59
75	552	276	122	....	....	....	308	154	77	356	178	89
100	736	368	162	....	....	....	408	204	102	472	236	118
150	1110	555	244	....	....	....	616	308	154	710	355	178
200	1474	737	324	....	....	....	818	409	204	940	470	235

Allowance for Efficiencies and Power Factor are Included—the Overload Allowance is not Included.

The first carload of pig iron ever shipped out of California left Shasta county this month. It was electrically smelted by current transmitted from a water-driven power plant.

California is rich in iron, but the cost of importing coking coal heretofore has made blast furnaces unprofitable.

House Wiring.

There are many points in connection with house wiring which do not always receive that degree of attention at the hands of the contractor which they merit. The majority of these arise out of the character of the building, the scheme of decoration or the tastes of the householder or individual members of his family. Others depend on the principles of illumination and although these are now far better understood than was the case some few years ago, instances still arise where neglect or ignorance of these results in either pecuniary loss or loss of prestige to the contractor who carries out the work, and the dissatisfaction of the client for whom it is being done.

Possibly in no other class of electrical installation work does the final result depend so much on the artistic taste of the contractor as in house wiring. Certain it is that in no other branch of illumination does this question of taste occupy so prominent a position. Not only is it essential during the preliminary planning out of the distribution of the lights, but it comes largely into evidence, especially where the client himself does not possess it to a marked degree, during the discussion which invariably takes place as to suitable designs for fittings and the questions as to of what metal they are to be made and how finished. It also enters largely into such matters as the length of pendants, height of standards and patterns and colors of shades.

The question of cost bulks largely in connection with all these points and more particularly so is this in the case of small private dwellings. When electric light is installed in small property the householder is seldom disposed to spend so much, in proportion, on fitting and shades as is the occupier of a much larger residence. But during recent years such advances have been made in the design and finish of cheap and artistic electric light fittings that tasteful and correct styles for the various rooms may be obtained and installed without any extraordinary expenditure. In methods of wiring also such improvements have been made as to render it possible to save expenditure on wiring or cutting away, and to allow more money for the purely decorative side of the lighting. It is possible to install and even conceal some of the patent conductors for less than it would have cost a short time ago to run up wood casing in the cheapest possible way. Such systems of wiring naturally have their place also in the better class residences, where by their aid it is possible, without chasing in and sinking the conductors, to carry them over valuable old oak panelling or elaborate mural decoration, without them being even noticeable, much less conspicuous. But in such case artistic taste is more necessary even than the exercise of extreme care.

In other directions the character of house-wiring work has altered. The protection of conductors is now far from expensive, and compared with the haphazard systems at one time in vogue is quite a scientifically arranged matter. Now the contractor can employ either iron, steel, lead, brass, paper or fibre conduits, use one or other of several admirable systems of metal molding, or at a slight extra cost can obtain capping and casing made with any design of molding, and from almost any wood he desires. At one time, unless the householder was prepared to spend a considerable sum on the work, the contractor could do no more than run ordinary white wood casing up by the side of the door, over the cornice at an angle which did not render any cutting away necessary and so across the ceiling until the point was reached where the light was to be attached. If the householder did not mind the slight extra expense the ceiling casing could be concealed between the plaster and the flooring of the room above, but he had to put up with the unsightliness of the upright casing unless he was prepared to have the room repapered, in which event the casing could be sunk into the plaster.

But today wiring methods have improved, the looping-in system, to which objection has been raised in some quarters, has cheapened the cost of installation, the improved technical knowledge of the contractor, the foreman and the wireman has removed unsightly work from the interior of the rooms, and the finished installation of a few years ago, carried out in the best possible manner and with the best available materials, could not compare for a moment with even an average installation of the present day.

In the matter of accessories also the contractor has more scope for artistic selection than was at one time the case. Neat designs of switch-plates, ceiling roses and point switches or wall sockets are now within the reach of the most modest purse, where previously they were unobtainable unless specially designed by an artist and produced by a skilled metal worker to suit the requirements of some particular building and turned out in small quantities at almost prohibitive cost.

With regard to fittings, this is true to an even greater extent. Electroliers, pendants, brackets, standards and shades were frankly copied from the gas fittings then in vogue. Neither taste nor originality was shown, and no effort on the part of either the householder or the engineer carrying out the installation could do other than make the best of a bad job. Many householders attempted, with some measure of success, to improve the effect by making their own shades from silk or paper; others were compelled to regard the comfort and convenience of the electric light as inseparable from bad taste, and were content to endure electroliers with solid-looking downright rods, heavy cast-brass arms with lavish and coarse scroll work, fitted with colored shades of crude tints, generally etched with some inartistic floral or geometrical design. Now all that is changed, and a visit to the showrooms of any of our large electrical firms will show the advances which have been made.

In addition to all these improvements the cost of lighting has been cut down by anything from 50 to 70 per cent by the introduction of the metal-filament lamp, and this reduction has naturally been followed by a great increase in the numbers of those who have had the electric light installed in their premises. There are still many, however, who regard the price of wiring as prohibitive. They view with disfavor also the general upset which is inseparable from the visit of the wireman when wood casing or conduit is used. They are not always, as has been said, enthusiastic about electric light, if the installing means each room converted for the time being into a workshop, floor boards ripped up, carpets and hangings soiled by plaster and sawdust, and passages filled with lengths of casing and tubing, with a possibility of the premises having to be rewired at some future time.

To such as these one or other of the newer systems of wiring should appeal with direct force, and the contractor should certainly point out to them the advantages of the way of cleanliness, absence of cutting away and making good, and speed with which the work can be performed.—*The Electrical Manufacturer and Installation Engineer.*

Gasoline Hazards.

There comes the report to *Insurance Engineering* that a fire starting from a gasoline stove destroyed five mercantile buildings in Lidgerwood, N. D., not long ago.

In Shreveport, La., on February 3, 28 buildings were burned by a fire caused by the explosion of gasoline in a dry-cleaning establishment.

Several smaller fires have been caused during the winter just past by the explosion of gasoline torches used in thawing out frozen water pipes.

Among the Contractors.

The Pierce Electric Company, of Chicago, has recently finished the electric wiring in the Hamilton Club Building and in the Harper Memorial Library, both in Chicago. J. N. Pierce, who, with his brother, manages the Pierce Electric Company, will be remembered as the donor of the $300 which was awarded in prizes for the best speeches on electrical contracting at the Chicago meeting of the Illinois Contractors' Association, not long ago.

The J. F. Buchanan Supply Company has rented a large store on Chestnut Street, Philadelphia, Pa., in the center of the shopping district, and is now fitting it out with fine store fixtures, where they will exhibit and demonstrate a full line of electrical fixtures and appliances for household use. This company has been engaged in electrical contracting and jobbing in Philadelphia for the past twenty years, and it is now convinced that the public will support the electrical merchant who merchandizes his goods in the right way. It is understood that within a month Philadelphia will have an electrical retail store the like of which the Quaker City has never seen before.

The Butte Engineering & Electric Company of San Francisco does an extensive electrical-contracting business throughout the Pacific Coast. At present it is putting in the entire electrical installation of the Journal Building in Portland, Ore., including a set of chimes which it specially designed and built.

Another important piece of work this company is doing in Portland is the complete electrical equipment of the O. R. & N. Railway electric drawbridge, consisting of special trolley work, switches, and the installation of a total of about 2,000 horsepower in motors—these motors to work in sets of 900 horsepower each.

In San Francisco the Butte Company is installing the electrical work in the new eleven-story California Pacific Title Building and the Polytechnic High School shop buildings, the latter being the largest school buildings in the city.

A recently completed installation was that of a two-phase alternating-current, five-ton crane equipment at the United States navy yard at Mare Island. The work done here exceeded the government specification requirements by 10 to 15 per cent.

The Butte Engineering & Electric Company does a strictly contracting business, selling no supplies or fixtures. It specializes largely in electric traveling cranes and hoisting machinery, of which it has made a number of notable installations on the Pacific Coast within the last few years.

Judson McFell.

So much has been said lately concerning the generally admitted fact that a large proportion of the men who undertake electrical contracting fail to realize profits commensurate with their efforts that it is especially pleasing to form the acquaintance of men who have attained real success in the profession, and to study the methods which they employ in order to insure success. One of these men is Judson McFell, of Chicago.

Mr. McFell has been engaged in electrical work all his life—that is, ever since he was old enough to earn a livelihood for himself. He entered the employ of the Western Electric Company, in Chicago, at the age of 21, and was connected with that company during the nine years that followed. Leaving the Western Electric Company in 1890, he organized the McFell Electric

Judson McFell,
President, McFell Electric Company.

Company, of which he became the president and treasurer. This company, whose main offices and shops are at 569 West Van Buren Street, Chicago, has been engaged in the electrical-construction and repair business continuously since then, and has enjoyed a constantly increasing measure of success and prominence. The company maintains a branch office in San Francisco, from which work undertaken in the Pacific Coast territory is directed. In the 22 years of its existence the McFell Company has done important electrical work all over the country.

Mr. McFell himself is not only a skillful electrician and a successful contractor, but he has done noteworthy work in the field of electrical invention. One of the first inventions to be perfected by him was the McFell Fire Alarm and Watchman Service System. Some idea of the excellence of this system may be gained from the fact that it is used in the new Northwestern Passenger Station in Chicago, and in such other plants as the Southern Terminal of the Illinois Central Railroad in New Orleans, the Burnside shops of the same road, the fire-alarm system of Hammond, La., and so on. Mr. McFell's latest invention is a new selector system for railway dispatching. This invention, which it took several years of tedious work and experimentation to complete, will be put into service on the lines of the Illinois Central Railroad within a few weeks.

A strong advocate of co-operation among contractors, Mr. McFell has always lent aid and encouragement to the spirit of fraternalism among members of the craft. His company is a member of the National Electrical Contractors' Association, of the Electrical Contractors' Association of the State of Illinois, and of the Chicago Electrical Contractors' Association.

Mr. McFell is a Canadian by birth, being the son of Joseph and Cynthia McFell, of Port Dover, Ont. He was educated at Ingersoll Collegiate Institute, Ingersoll, Ont. He is a Shriner and a member of the National Union and Royal Arcanum. A man of quiet demeanor, courteous to strangers and generous to his friends, he is a gentleman whom it is a pleasure to meet casually and a still greater pleasure to know well. Mr. McFell lives at 7209 Union Avenue, Chicago.

Membership of National Electrical Contractors' Association.

President Barnes announces, in the columns of the *National Electrical Contractor,* that the membership of the National Electrical Contractors' Association is rapidly approaching the twelve-hundred mark. It is hoped that the membership will reach fifteen hundred before the next annual convention, to be held in Denver, July 17 to 19.

High Mica Prevents Voltage From Building Up.

A writer in *Power and the Engineer* tells of a case in which a direct-current dynamo could not, by the application of the usual methods, be made to build up its voltage. Finally the operator took a sharp chisel and cut down the mica between the commutator segments slightly. When this had been done and the commutator smoothed down with sandpaper, the machine readily built up its normal voltage.

Copper and copper manufactures imported into and exported from the United States in the fiscal year 1911-1912 will approximate 150 million dollars in value, or more than ten times the total of 1892 and almost two and one-half times that of 1902.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Novel Scheme for Wiring Burglar Alarm.

Not long ago I was called upon to install a burglar alarm on the door of a house in the yard of the owner's residence, an arrangement being desired of such a nature that the opening of this door would ring a bell in the residence. I bought a common spring screen-door hinge and fastened it on the casing near the top of the door,

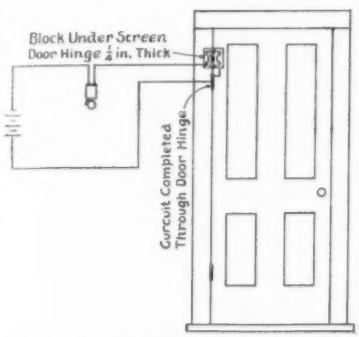


Fig. 1.—Arrangement of Alarm Circuit.

placing a block about a quarter of an inch thick under the hinge so that while the door remained shut the hinge was held clear of a piece of copper plate which I had fastened on the edge of the shutter itself. I then attached one terminal of the bell circuit to the spring hinge, while the other was attached to the regular hinge of the door and a wire run from there to the copper plate. Now whenever the door is opened the circuit is closed and the alarm sounded. Moreover, this construction leaves none of the wires exposed to sight and eliminates the liability of their being broken.

J. E. Taland.

Installing Flexible Loom in Old Buildings.

I have tried several different methods of placing flexible loom in walls of old buildings and have found the following one to work to the best advantage. I believe it will be useful to others.

I first bore a five-eighth-inch hole through the plate above the wall, and also the outlet hole in the side wall. I place my helper in the attic or on the floor above, with a roll of wire and a piece of closet chain, which he has already fastened to the covered wire. He then drops the chain down between the walls and I draw it out through my side-wall outlet, pulling down as much wire as I think it will take to reach from my outlet through the plate above. I then cut off a piece of loom the proper length, hold one end high and run the chain through it; I pull the chain clear through the loom and remove it from the wire, leaving about six inches of wire projecting through the loom; this wire I bend over the end and hold it firmly against the outside of the loom.

I give the signal for my helper to pull his wire back, and in so doing he pulls the loom right into place with it.

W. A. Hines.

Supports for Conduit.

I find the method described in the following note a very effective one where conduit has to be supported on either concrete or brick ceilings or on walls. I take a half-inch star drill and make a hole in the concrete or brick about an inch deep. Then on a three-sixteenth-inch flat-headed stove bolt two inches long I wind wire solder in the manner indicated in the figure, covering the bolt

Fig. 2.—Stove Bolt with Solder Wound On It.

throughout about three-fourths of this length. The next step is to take a piece of three-eighths-inch gas pipe about five inches long and hammer it at one end so as to make the opening smaller. I then put the head of the stove bolt in the hole in the concrete and slip the gas pipe, hammered end first, over the bolt until it comes in contact with the solder, after which I hammer on the outer end of the pipe until the solder is driven home. Thus the solder is flattened out and holds the bolt securely in position always thereafter.

The bolts thus installed are employed for holding the pipe straps which keep the conduit in place.

I find it best to use bolts of the length just mentioned, because the concrete may break and make it necessary to drill the hole deeper than was intended. When the pipe strap is in position and the nuts tightened up I break off the projecting ends of the bolts with a pair of pliers.

I have found the above construction especially convenient on brick walls where the mortar line was very narrow. It is much better than the wooden wedge so often employed.

Lewis T. Haldeman.

Removing and Replacing Floor Boards.

Often one sees where floor boards have been removed in making pockets, that the boards are sunken a little, which is easily detected through the carpet or rug. When nailing a cleat on the joist to support the end of a floor board where a pocket has been cut, drive the first nail slanting upward and so it projects through the strip a trifle. Do this before putting the cleat under the floor, and be sure the cleat is a little longer than the width of the opening in the floor. Then place the strip in position and drive the nail home. It will draw the cleat up snugly against the other boards of the floor. Then drive in the required number of nails slanting a little downward to hold the cleat securely against any load the floor board may be called upon to carry. Remember that someone may move a heavy piece of furniture by turning it about on its corners, and the corner temporarily bearing the weight may come on the piece of floor board covering your pocket. So, use heavy enough cleats and don't be stingy with your nails. Then, by first having "drawn" the cleat upward as above described, the board will be level with the rest of the floor at the beginning and will not settle in time.

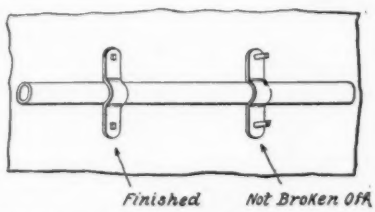


Fig. 3.—Supports After Conduit Is In Place.

C. W. Goddard.

Testing Motor Fuses.

A kink that may be useful to contractors on motor installation work was used with great satisfaction on a job we put in recently. As the inclosed "indicating" fuses refused to indicate, great trouble was experienced by the owner in learning which fuse or fuses had blown. He not only knew nothing about electricity, but was afraid of it and could not overcome this fear. Consequently, we were called on repeatedly to replace fuses for him, and this soon ate seriously into the profits we were getting from the current, as he was a short-hour user. We finally installed a 220-volt lamp with leads long enough to reach all fuses. He can now test out the fuses and locate the trouble himself.

A. E. Anderson.

National Electrical Inspectors' Association

THOMAS HENRY DAY, President, 59 Deerfield St., Hartford, Conn.
JAMES BENNETT, Vice-President, 524 Coristine Bldg., Montreal, Que.
WILLIAM LINCOLN SMITH, Sec'y and Treas., Concord, Mass.
JAMES E. COLE, National Conference Representative, 11 Wareham St., Boston, Mass.

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Secretary's Message.

The Secretary desires to state that the dues for the current year are now payable. Bills have not yet been sent out because of the presence for a month of measles in the home, and further, because a membership list is being printed and he desires to save postage by combining the two things. In case any member desires to send along the dues without waiting for his bill, the Secretary will omit this formality and simply send a receipt. Moreover, he can use the money to great advantage right now.

The Secretary has received the following letter and earnestly requests every member to consider it and send in any field experience along this line which he may be possessed of, which can, a month later, be used in a symposium.

This is where *you* can help your executive committee; *and please do it*:

"We have had a great deal of complaint in regard to the size of terminal leads on motors as supplied by the motor builders.

"When the installing electrician has been required to use a certain size of wire in running his circuit for a given motor, and then finds that he must connect to a motor terminal lead, which is also of rubber-covered wire, many sizes smaller, he feels that either he has been "over-regulated" or the motor manufacturer has not been regulated at all. Where terminal lugs are provided by the motor builder, they are frequently of such size and design that they will not accommodate wires of a size required by the Code rules for wiring construction, so that larger lugs must be substituted, or else the wire or cable must be materially cut down in size at the terminal connection.

"While recognizing that the winding of the motor, being of other than rubber insulations, may be considerably smaller in size than the external wiring circuit, it is nevertheless apparent that a rubber-covered motor lead is subject to the same overloads, and, furthermore, is exposed to greater mechanical injury, vibration, damage from oil, etc., than the wiring circuit itself.

"We recently had a case where the wireman, to provide proper wiring capacity for his motor rating, used a 2/0 conductor, and when he was ready to connect in at the motor found No. 6 rubber-covered terminal leads provided by the motor manufacturer.

"This is perhaps an extreme case, but it illustrates the general condition existing.

"Could not this matter be taken up with the National Fire Protection Association by our Association, with a view to securing from the motor makers a factory design more consistent with the National Code?"

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Proper Location of Lightning Arresters.

Question 178. Is it not the intent of Rule 5b that lightning arresters be installed on inside walls of stations and not on poles outside or on outside walls of stations?

Answer 1. Rule 5*b* does not specify; the lightning arresters may be installed either inside or outside of stations, provided they are installed in a proper manner and as near as practicable to the point where wires enter the building.

Answer 2. I understand that the proper place for a lightning arrester under Code Rule 5*b*, would ordinarily be on the inside surface of the outside wall, as near as practicable to the point where the wires come through that wall, but readily accessible and properly separated from combustible materials.

Answer 3. No, not necessarily. Immediately outside would meet the requirements, but as near as possible to where the wires enter and not on a pole, say the width of the street away.

Answer 4. The Code does not specifically state where lightning arresters should be located, but it is generally conceded that where practical the outside location would be the most desired.

Answer 5. There is apparently a strong inference that Rule 5*b* contemplates the station arresters within the building, from the fact that the rule is under the general heading "Stations and Dynamo Rooms" and the further fact that in the second paragraph sharp bends, etc., are prohibited "between arresters and out-door lines." I believe however, that the question is one of engineering rather than of fire hazard, and that the station arresters should be approved whether inside or outside, if properly protected and installed in other respects according to the Code, and located as near as possible the point where the aerial lines enter the building.

Answer 6. I do not think that Rule 5*b* is really intended to prohibit the placing of lightning arresters on the outside walls of station or on poles adjacent thereto.

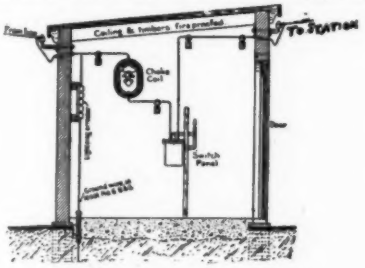
Answer 7. We would require lightning arrester to be inside the walls.

Answer 8. There is nothing to indicate whether the arrester should be inside the "station" in Rule *5b*, further than the use of the word "building" without qualifications and the reference to kinks, etc., between the arresters and outdoor lines.

I feel absolutely confident, however, that the matter is an engineering one and not a code question distinctively. The location of both station and lines with reference to the frequency and violence of lightning disturbance must be considered.

Very frequently I feel that on no account should the arresters be in the station; neither should they be on a pole or outside wall of the station.

They should emphatically be in an independent fireproof building closely contiguous to the station itself. The overhead line should enter this building first of all, then meet an arrester, then a choke coil, then another arrester, another choke coil, etc.—as many as may be deemed wise—and finally, an emergency



A Lightning-Arrester Installation.

switch, if desired, and then pass into the station, preferably in conduit.

The arrester house should be cellular, of course,—in the case of high tension lines or wherever the arresters and other apparatus are sufficiently valuable to warrant individual isolation.

I believe that there should be a coke plate ground always, in addition to everything else. And it should always be remembered that even a moderate bend in a wire offers a very considerable impedance to the free passage of the lightning discharge.

Answer 9. In regard to the location of lightning arresters, I have felt that they should be installed inside the station; that is, those arresters installed on the station end of the lines. Section *b*, of Rule 5 seems, to my mind, to have made this very clear:

"Must be located in readily accessible places, away from combustible materials, and as near practicable to the point where the wires enter the building."

The "readily accessible places" would clearly indicate within the building, while "away from combustible materials," would also aid in reaching such a conclusion. The words, "as near as practicable to the point where the wires enter the building," while a little ambiguous, it is true, seems to indicate, when we read the last part of Section *d*, that the arresters should be located in the station. Practice certainly justifies one in such a conclusion.

Grounding Lightning Arresters Within Buildings.

Question 179. May grounds for lightning arresters be made inside of buildings where they are not made to gas-pipe grounds?

Answer 1. Grounds for lightning arrester may be made inside of fire houses and substations, but should preferably be carried to the outside in other classes of buildings. Where grounds are made inside of buildings great care should be exercised in the method of making them.

Answer 2. Yes. I consider it better to make the ground within the building because it will aid in lessening the number of bends and turns, something to be considered that the ground wire may render all the possible good.

Answer 3. There is nothing in the Code to prohibit lightning arrester grounds on the inside of building, if not made to gas pipe.

Answer 4. Yes.

Answer 5. Yes.

Answer 6. Grounds may be made inside the building if not made on gas pipes.

Answer 7. Yes.

Answer 8. Yes. I think there should be a thorough ground by means of a coke plate, and, in addition, all groundable metal work, except, of course, the generating and distributing apparatus, should be utilized, to avoid all chance of harmonic oscillation discharges, side strokes, etc.

London Electric Supply.

One of the London electric supply companies which for years appealed to Parliament for permission to link up its two stations serving districts north and south of the River Thames, and at last succeeded, completed this interconnection during the past year, with the result that its consumers in both areas now have additional security for continuity of supply. It is also enabled to make more economical use of the generating plant installed in the two power houses (Wandsworth and Finsbury). The aggregate output for the year was over 27 million units, and the dividend is better than ever before in the company's history.

A committee of the London County Council is to examine government records, take expert evidence, if necessary, and generally to investigate the whole question of London's future power supply in order to prepare the way for the adoption of a uniform policy simplifying the matter of operation under one control when the whole of the undertakings, municipal and company, fall due for purchase. It is recognized that there may be stations which it would be economical to scrap, also that much good might ensue from co-operative working or mutual assistance. Two local authorities whose areas are contiguous—Poplar and Stepney—thinking that under their co-operative working proposals they could give cheaper supply to other municipal authorities, and so save the latter extending their plants, made an offer to Hackney Council to give a bulk supply at £3 per kilowatt demanded, plus 0.33 pence per unit (high tension at their own switchboards), but Hackney's engineer declares that this is higher than its own cost would be. Its present figure per low-tension unit generated is £3.41 per kilowatt plus 0.355 pence. It is therefore proposed to proceed with a new three-phase high-tension scheme for Hackney alone (cost one million dollars ,including three 3,000-kilowatt turbo-alternators and three substations, mains, feeders, etc.). In this idea L. L. Robinson, the borough electrical engineer, is supported by A. H. Preece, consulting engineer, whom the Council called in to advise.

The single-phase railroad load has greatly assisted the London Electric Supply Corporation. Its sale of energy to the London & Brighton Railway increased during 1911 by 73 per cent. Simultaneously it found electric driving making such headway among factory owners in the district that these consumed 87 per cent more than in 1910. Both factors increased the output sold by seven million units, making it over 20 millions, with the result that the cost per unit sold fell by 21 per cent (from 1.03 to 0.82 pence).

Two of the other leading supply companies in London which some years ago put down a joint bulk-supply works, to supplement their original plants, are getting a continuous benefit from the arrangement. They are the Saint James's and the Westminister. The chairman of the former recently said that in their experience they had proved that the day of scattered stations was gradually but surely passing away.

Public Service Commissions

WISCONSIN.

The Commission has refused to authorize the Plymouth Telephone Exchange to increase its rates until that utility brings its accounting methods into conformity with the Commission's requirements. After such investigation as was possible because of the incomplete records and the lax accounting system of the petitioner, the Commission was of the opinion that an increase in revenues was justifiable and necessary. The present net rates for single-party residence and business telephones are $1.10 and $1.75 per month, respectively; the rates petitioned for were $1.50 and $2.50, respectively. The revenues which would be derived from the latter rates would be more than sufficient to return a reasonable profit on the investment. The order provides that, as soon as the utility adjusts its accounting system, a schedule including rates of $1.25 for single-party residence and $2.00 for single-party business telephones, will be authorized.

The Commission has issued an order authorizing the physical connection of the systems of the Cecil-Green Valley Telephone Company and the Linzy-Brook Telephone Association. Both parties desired to make the connection and it would have been done voluntarily some time ago were it not for the fact that, according to certain contracts which both companies have with the Wisconsin Telephone Company, such physical connection would result in the severance of all toll connections which the companies now have through the Wisconsin Telephone Company's system. According to the decision of the Commission, if the contracts are nullified by its action, an order requiring their re-establishment will be issued. This is the first order issued by the Commission under the state law requiring physical connection of telephone systems if public convenience and necessity require such connection.

ILLINOIS.

The Illinois Railroad and Warehouse Commission proposes in the near future to exercise over the elevated railways of Chicago the same jurisdiction with regard to safety devices and rules that it does over the steam and electric lines of the State. The Commission proposes to inaugurate a system of rules covering the operation of block signals and interlockers and other matters dealing with the operation of elevated trains. This action will be taken as the result of special reports made by A. R. Ewald, chief engineer of the Commission.

NEW JERSEY.

In response to an inquiry from the City of Camden regarding the desirability of supervision by the city of the quality of gas furnished and the kind of meters installed by the local company, the Board of Public Utility Commissioners has advised against the establishment of a public meter-testing station in that city. The order of the Board issued October 17, 1911, makes such action by the city unnecessary. When the provisions of this order have been entirely carried out, all meters will have to be tested before installation, and no meter left in service for a period longer than six months. Meters must be tested without charge whenever a customer complains, unless such complaint is made oftener than once in six months. Companies must use standard meter provers, which have been certified by the inspectors of the Commission, and records must be kept of all tests. The Commission considers that when this system has been fully established there will be little question as to the accuracy of meters, and when a meter is suspected of being inaccurate the remendy will be simple. Each testing station operated by a gas company will be under the supervision of an inspector of the Commission. A station of the nature contemplated has been in operation in Newark for many years and the expense of testing new meters before installation by the city has been regarded as a waste of money. Companies are also required to make periodic tests of all gas supplied.

Similar considerations apply to the testing of electric meters, so that it is considered unnecesary for local authorities in New Jersey to adopt any means for control of this matter, as the regulations and inspections of the Commission will safeguard the consumer in every case.

The Public Service Electric Company, the electricity department of the Public Service Corporation of New Jersey, has filed with the Public Utility Commissioners a schedule of prices for municipal street lighting providing for a material reduction. It is estimated that it will decrease the revenue of the company from $100,000 to $97,000 a year. In Newark it will reduce the price for each street arc light from $70 to about $65 a year.

NEW YORK.

The Public Service Commission of the Second District has issued an order in the matter of the complaint of residents of Coxsackie against Upper Hudson Electric Company directing the company to cease and desist on or before June 1, 1912, from charging its customers in Coxsackie any higher rates for commercial lighting than are determined by and under the following basis. While the company maintains in its Coeymans district (comprising the villages of Ravena and Coeymans) commercial lighting rates which are lower than the rates shown to be established in competition by the Atlantic Light and Power Company in the Coeymans district, its commercial lighting rates in Coxsackie shall be to the same extent less than its present rates for lighting in Coxsackie. Complainants alleged that the company's rates for commercial lighting in Coxsackie of 15 cents per kilowatt-hour up to 7 kilowatt-hours and scaled to 7 cents per kilowatt-hour over 250 kilowatt-hours were unjust and unreasonable and unjustly discriminating as compared with the company's rate of 6 cents per kilowatt-hour for metered service in any quantity which it applies in the Coeymans district. It was shown that in the Coeymans district the respondent company is in competition with Atlantic Light and Power Company which has in effect in that district rates of 12 cents per kilowatt-hour up to 10 kilowatt-hours and scaled to 7 cents per kilowatt-hour over 150 and up to 200 kilowatt-hours, the rates over 200 kilowatt-hours being made on special contract. The respondent company's cost of service in the Coeymans district is higher than it is in Coxsackie. Its six-cent rate in the Coeymans district is much lower than the rates fixed by its competitor in that district, and therefore it appears that its lower six-cent rate is not due to the compulsion of rate competition. By creating such wide disparity in rates

between Coxsackie and the Coeymans district, the opinion of the Commisison, which was prepared by Commissioner Martin S. Decker, declares that the respondent company wholly disregards differences in its cost of service. The opinion also declares that a public duty to treat all patrons equitably under existing conditions devolves by the statute upon the respondent and every other electrical corporation, and under the regulation imposed by the State, competition may not be made the excuse for abuse; that the mere assertion of existing competition does not justify rate disparities as between localities; that when such rate disparities are sought to be justified by competition the company complained of must show that the competitive rate it maintains is one fixed by the competing company; that it has at the same time provided adequate service; and that the rate it is obliged to meet in competition, while yielding to it some profit over assignable cost and assignable income deductions, is unreasonably low as applied to its business and service. The opinion also states that in the case at issue no proof was furnished that the 12-cent scale rates of the Atlantic Light and Power Company in Coeymans are in fact unreasonably low, but that if they are, the respondent company has gone much farther and fixed its rates in the Coeymans district far below the scale of the competing company; that in fixing its rates in Coxsackie and in the Coeymans district, its cost of service in the latter being considerably higher than in the former locality, the respondent company has created wide rate disparities wholly regardless of cost differences and regardless of justifiable competition with the Atlantic Light and Power Company, and that by such action the respondent company is giving undue preference to its Coeymans-district customers and subjecting its Coxsackie customers to undue and unreasonable prejudice and disadvantage; that the rates in the two districts are relatively unjust and under the present system of charges, the higher Coxsackie rates are relatively unreasonable, and that its legal duty is to remove that discrimination.

MARYLAND.

In the complaint of the electrical contractors of Baltimore against the Consolidated Gas, Electric Light & Power Company regarding the sale of electrical appliances and the wiring of buildings by the latter, the Public Service Commission dismissed the case. The opinion states that the right to do such business was expressly given to one of the companies whose franchise is now held by the Consolidated Company, and in addition that the public benefits by having the company carry on this business. The act regulating public-utility companies gives the Commission power to control this branch of the company's business and redress may be had at any time by customers in case the company should, after eliminating competition, raise its charges to an unfair point.

At the hearing on this matter Mr. Strauss argued for the contractors that the Consolidated Company has no right to engage in the business of wiring houses, repairing electrical machinery and selling electrical fixtures, that its charter did not confer that power upon it, nor did the charters of any of its constituent companies. The only suggestion of such a grant of power, he contended, was in the charter of the Edison Electric and Illuminating Company, which had been absorbed by the Consolidated. The language of the charter in this case, he asserted, is ambiguous, and in the construction of it the Commission is bound to follow the rule, laid down by the Court of Appeals, that all inferences of power shall be against the grantee. Mr. Cook, for the company, held that the powers contained in the grant of the Edison company are broad and liberal and expressly confer upon the company the power to engage in the manufacture and sale of electrical machinery, appliances and fixtures, and to engage in a general merchandising business with reference to these articles as well as to engage in the manufacture and sale of electricity. But even if the grant had not been expressly conferred, he maintained that the company would still have the right under the law to engage in the business as incidental to its main business of manufacturing, selling and distributing current. He insisted that the company was not conducting that branch of the business at a loss, but the profit was immaterial. The company, he said, was doing work of this character simply to increase the sale of electricity, and the company would be glad to drop it if the contractors would do the work properly and cheaply. He made the point that the business of wiring houses was confined to old houses with which the contractors did not care to bother, and which work required a great deal of care. The company, he said, had wired no new houses as far as he knew.

Glass Poles for Telegraph Work.

It is stated that glass poles are now being manufactured for telephone and telegraph service. The glass is strengthened by interlacing and intertwining it with strong wire threads. It is claimed that poles of this kind show their superiority over wooden poles in their resistance to the ravages of insects in tropical climates and to the effects of rain, snow and sleet in other climates.

A NATIONAL CAMPAIGN FOR INCREASING THE POPULARITY OF THE ELECTRIC VEHICLE.

Commonwealth Edison Company Announces New Low Rate for Charging Storage Batteries of Electric Vehicles—Inauguration of Chicago Section of the Electric Vehicle Association of America.

As was reported briefly in the last issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, the Commonwealth Edison Company, Chicago, gave a dinner on the evening of Tuesday, May 7, to over 100 representatives of central stations, electric-vehicle manufacturers, manufacturers of storage batteries and other accessories, and representatives of the technical press. There was an enthusiastic gathering, and a Chicago section of the Electric Vehicle Association of America was inaugurated. The toastmaster was Louis A. Ferguson, who on behalf of the Commonwealth Edison Company made a very impressive and interesting address. Mr. Ferguson said in part:

"The tendency of the times all over the world is toward power wagons, and, further, toward *electric* power wagons, for reasons of cleanliness, noiselessness, ease of control, absence of objectionable odors, and reliability.

"The Commonwealth Edison Company is a firm believer in the electric vehicle. This is not due to any sentimental reason, but from the fact that after ten years of operation of electric trucks their value has been amply demonstrated. The company is now operating 44 such trucks and has 25 additional now on order, making a total of 69. The general policy of the company is to replace as fast as practicable all its horse-drawn vehicles with electric trucks, so that ultimately this number will be largely increased.

"We believe that the extended use of the electric vehicle will benefit not only the vehicle manufacturers and the central-station companies, but will also be a distinct boom to the business world in general, as the many advantages to the general public of this modern means of transportation cannot be over-estimated. The Commonwealth Edison Company is trying to do its full part in the development of this business. We have from time to time published literature on the subject; have devoted the services of several men of our organization to this particular part of the business, and have frequently advertised the electrical vehicle in the daily press and other papers.

"We are now prepared to announce a new off-peak schedule especially applicable to electric-vehicle charging, be-

ing a very material reduction from our present rates. This should prove of great benefit in extending the use of the electric vehicles in this community.

"While it is true that of the total cost of operating a commercial electric truck the cost of electricity is very small, being under eight per cent; yet, as the monthly bills come in with machine-like regularity, the item of electric power gets a wrong perspective, so that this item, which really is one of the small factors in the total cost, takes an undue prominence. In order to improve this condition as much as possible we are about to put into effect an off-peak schedule effecting installations of a monthly maximum demand of 50 kilowatts or over. The off-peak features are that no charging be done between 4:00 p. m. and 8:00 p. m. during the months of October, November, December, January, February and March.

NEW OFF-PEAK RATES.

K. W. H. Maximum.	Consumption. Per Month.	Rate per K. W. H. D. C.	A. C
50 K. W.	15,000 K. W. H.	0.024	0.0222
75 K. W.	22,500 K. W. H.	0.0211	0.0188
100 K. W.	30,000 K. W. H.	0.0196	0.0172

"These figures represent a reduction of about 20 per cent from our present wholesale schedules."

Mr. Ferguson called attention to the fact that while rates for charging the storage batteries of electric vehicles had been constantly reduced during the last few years, the cost of keeping horses during the same period has greatly increased. As a matter of fact, during the last five years oats have increased in price almost 30 per cent, horses 40 per cent, and hay about 100 per cent.

The City of Chicago offers a great field for the use of electric vehicles. The conditions are very favorable, said Mr. Ferguson. The streets are very level. Because of the scattered terminal facilities the principal markets, and the great volume of traffic in merchandizing of every character in the down-town district, there is probably more teaming per capita in Chicago than in any other American city. The following data is of interest upon this point:

Number of pleasure electrics in Chicago	2,000
Number of commercial electrics	250
Number of commercial electrics probably sold in 1912	250
Total number miles streets	2,978
Number miles of paved streets (of which 1,200 miles in very good condition)	1,652
Number of miles additional streets paved between railroad terminals	100
Total miles good usable streets	1,300
Average of 100 miles of streets paved during each of past five years; and during the coming two years there will probably be	250

Cost of maintaining 2,000-pound commercial electric wagon running 10,000 miles per year divided up about as follows:

	Cost Per Mile.	Percent of Total.
General Expense:		
Wheel Tax and State License, Garage Rent, Supervision	$.018	12.2
Operating Expenses:		
Fixed charges (interest, depreciation, taxes and insurance)	.04	27.10
Tires	.025	16.9
Washing and minor repairs	.024	16.26
Battery renewals	.019	12.90
General repairs	.011	7.44
Electricity (new rate)	.0106	7.2
Total cost per mile, exclusive of driver	$0.1476	100.

Mr. Ferguson said he believed that the best results will be secured in fairly large garages, which can afford to employ competent attendants and first-class facilities.

In closing Mr. Ferguson emphasized the importance of all the elements interested in the success of the electric vehicle to join forces in sane and serious co-operation. Particularly was it necessary that the manufacturers of electric vehicles unite in promoting the popularity of their machine on a broad-minded basis, refraining from making unfortunate reflections upon competitive cars, and above all to stand together to correct the abuse of ridiculous guarantees. This must be done in order that confidence may be developed. The electric-vehicle business today is suffering because prospective buyers are demanding excessive performance and maintenance guarantees, the like of which are never required of gasolene or any other form of transportation.

Mr. Ferguson introduced W. H. Blood, Jr., president of the Electric Vehicle Association of America, who said in part:

"The Electric Vehicle Association originated in Boston. Shortly after the second advent of electric vehicles in Boston, an Electric Vehicle Association was formed. This was in March, 1908. After two years of successful life, it became apparent that New England was too narrow a field, and that to be a complete success the Association must be national; consequently, in September, 1910, the Electric Vehicle Association of America was incorporated, with a charter membership of 29. Because of the national character of the Association, New York was chosen as its headquarters. The membership now is 250. The old Boston association affiliated itself with the national organization and has been formed into a New England Section. Affiliation with a national organization is of advantage to the entire industry. It tends to reduce duplication of work, to secure uniformity of practice throughout the country, and to bring about co-operative action, all of which enures to the benefit of the entire industry.

"The national Association has regular monthly meetings in New York, at which, during the past two years, excellent papers have been read followed by profitable discussions. Besides many valuable papers which have been presented at the conventions, there have been a number of instructive committee reports.

"A Standardization Committee has brought out a charging plug which seems likely to be generally adopted as a standard by all of the vehicle interests. This Committee is also striving to secure standardization of batteries, uniform voltage of lamps, reduction in the number of different sized tires, etc.

"A Committee on Rates and Charging Stations, of which townsman, John F. Gilchrist, is chairman, has compiled a most interesting lot of statistics on rates, which cover almost the entire country, and they have been arranged in such a way as to be of great value.

"An Insurance Committee has been compiling statistics to show the insurance interests the difference between electric and gasoline vehicles. As a result of this Committee's work, it is probable that we shall shortly secure a differential of 25 per cent in favor of the electrics.

"The Committee on Education, so-called for want of a better name, is arranging to establish in trade schools and Y. M. C. A's, courses of instruction and lectures to familiarize the young men of the country with storage batteries and with electric vehicles.

"The Association is now engaged in a national advertising and publicity campaign. The plan has been to raise a fund of $50,000 to spend in national advertising. The co-operation of the central-station interests, electric-vehicle manufacturers, storage-battery people, and also accessory manufacturers have been secured. Almost the full amount has been raised and the contributions are coming in daily. This advertising will start in the June numbers of the national magazines and trade papers.

'The idea of this advertising is to tell the American public that the electric vehicle is no longer a toy, an experiment, or a luxury, but that it is a commercial proposition; that the electric truck is for city service the ideal solution of the transportation problem; that it will do the work better and cheaper than by any other means. It is also intended to bring out clearly the cleanliness, simplicity and dependability of the electric pleasure car.

"None of the advertisements will contain the name of any vehicle, storage battery or accessory; the idea of the campaign is to advertise the electric vehicle as such, without naming any particular kind.

"In the early days the electric vehicle was clearly at a disadvantage; nevertheless, it worked, and many of the early machines are still in service and are preforming their daily tasks. The early electric car was clumsy and hardly more than an adaptation of the old horse-drawn vehicle; the batteries were

heavy and good for comparatively short distances. The attitude of the central station toward the installation of electric vehicles in the early days was not conducive to their general introduction, for I think that most managers looked upon the charging of storage batteries as a nuisance and made rates for current in accordance. Today, however, all of these conditions are changed. The modern truck, which is an evolution of the older types, has many points of superiority over the older types. The battery is lighter and more efficient and is capable of giving a mileage two to three times that obtained by the earlier batteries. The central-station people have awakened and they now realize that the charging of electric vehicle storage batteries is a profitable off-peak business which it is well worth while to secure. In regard to this latter point, one manufacturer of electric vehicles alone advertises that the current which is used by the vehicles it has sold amounts to about seven and three quarter million kilowatt-hours per year. Certainly this is a business worth going after.

"The more progressive central stations throughout the country now realize that in order to get customers to use electric vehicles, they must themselves set an example by using them for their own business. The Commonwealth Edison Company has at the present time 50 electric vehicles in their use; the Boston Edison Company has 45, and the New York Edison Company has about 100.

"In a letter recently sent out by the Boston Edison Company to its patrons, the following statements were made: We have made an exhaustive study of this subject and as a result will replace all our horses and gasolene cars with electric; we no more anticipate going back to horses or gasolene cars than our customers do returning to gas, kerosene or tallow dips; none of us can afford to use other than the most reliable, economical and efficient means of either lighting or transportation. Backing up this public announcement, the Boston Edison Company is carrying on a campaign of enlightenment upon which it has spent for advertising between $40,000 and $50,000, and it has also invested something over $100,000 in vehicles. It is probable that within the year it will have expended in this general campaign something like $200,000. It is not at all likely that the company will, during the first year, see a return of this expenditure, but it is planning for the future, and it realizes that the investment of this money is good business."

Mr. Blood said he did not know just what the Commonwealth Edison Company is planning, but he did know that the officers of the company fully realize the importance of the campaign. He called attention to the statement made by Louis A. Ferguson in an admirable address which he made before the Electric Vehicle Association of America at one of its conventions, emphasizing the value of the electric-vehicle business to the central station, and showing that where the average monthly income from electricity sold to flats was $1.84; to houses $3.08; to small stores $4.32, that the income from electric pleasure vehicles averaged $6.87; 3,000-pound trucks averaged $12, and three-ton trucks $20.

Mr. Blood said that the president of the New England Section of the Association who has a mathematical turn of mind, very aptly stated the proposition as follows: The electric vehicle + battery + central-station + consumer = success; he further goes on to state that by placing the negative sign before any one of the members of the equation, the term on the right of the equality sign is at once changed to "failure." In other words, there must be complete co-operation of the allied interests to bring about success.

He could not emphasize too strongly he said, the importance of vehicle manufacturers keeping on good terms with one another and of refraining from knocking each other's machines. Calling attention to the defects of a competitor's vehicle, instead of endeavoring to create a favorable impression in the mind of the prospective customer of one's own product, is apt to make a customer suspicious of electric vehicles as a whole and compel him to stick to horses or turn to gasolene trucks. To sell electric vehicles, the salesman must study the customer's needs. It is not good business to try to place an electric truck where it is obvious that because of the short haul and long waits, a horse would be much cheaper; nor is it wise to install an electric truck to compete with gas trucks where the service required is to make very long runs with infrequent stops. The great middle field, short hauls and frequent stops, is the one which is the legitimate and economical field for the electric vehicle.

Electric motor wagons for the transportation of merchandise, are beginning to be sold and used in fleets. This is made evident from the installation of the Adams Express Company, with 250 electric trucks; of the Ward Bread Company, 230 wagons; of the New York Edison Company, 100 vehicles; of the American Express, 86; Gimbel Brothers, 76; Jacob Ruppert, 72; George Ehret, 63; Peter Doelger Brewing Company, 57; Ward Corby Company, 56; United States Government, 52; Commonwealth Edison Company, 50.

There is a great future for the electric truck. The antiquated horse will sooner or later be legislated from the city streets, both for sanitary and humanitarian reasons. The cleaning of the city streets alone is an expense which, if one takes the pains to investigate city records, is found to be most startling. During a few days of the hot wave of July last in the four cities of New York, Chicago, Philadelphia and Boston alone, 3,752 horses died of exhaustion. This carried with it a property loss of approximately $1,000,000. The electric truck is not susceptible to glanders, it does not fall upon the slippery streets and break a leg. It can be abused of course, but it is an inanimate thing and abuse hurts nothing but the owner's pocketbook.

Already legislation favorable to motor trucks in certain cities is being proposed, and in some of the foreign cities has already been enacted. A differentiation between gasolene trucks and electrics is also being made. Gasolene trucks are not allowed on any of the wharves or piers in New York or Boston, because of the danger from fire. Mr. Blood said he had been told that a recent order has been passed by the Board of Health in New York City prohibiting the use of gasolene trucks for the hauling of dressed meats. The construction of gasolene garages in certain sections of some cities is prohibited unless the garages are of strictly fire-proof construction.

Quoting from his annual address of last year, Mr. Blood further said that a hasty investigation shows that over the streets of Boston alone 25,000 tons of freight are handled on the average each day in the year. The amount handled by wagons throughout the country is estimated to be at least ten times greater than that which is handled on all the railroads put together. It would seem from these calculations, therefore, that the number of power wagons necessary to do the trucking of this country, and considering only those which can be advantageously handled by electric power, indicates that nearly 3,000,000 such wagons would be required.

The impetus which the Electric Vehicle Association of America is giving to the industry is worthy of note. Two representatives of large manufacturing institutions told Mr. Blood within the past month that the business of one of them in January was 282 per cent larger than the same month for the previous year, and that there had been, up to that time, the largest month during their existence; the other gentleman said that their business during January, February and March of this year was 80 per cent of the business done during the entire year of 1911.

THE ECONOMY OF VARIABLE-SPEED MOTORS.

By J. F. Nisbet.

It is only within comparatively recent times that any authentic data have been available showing conclusively the intermittent operation of the majority of machine tools. This knowledge has led to the adoption of motors with intermittent rating for a great many applications, and has allowed the motor manufacturers to design a motor of smaller size for service not exceeding two hours' continuous operation.

Such a motor will meet the majority of machine-tool requirements, and has considerably reduced the first cost incidental to equipping a shop with individual motor drive.

These results have been brought about by a careful analysis of the various operations, which proves conclusively that after taking into account the time required for loading, cutting, unloading and various other delays, a motor rated for continuous duty is unnecessary.

In almost every shop two distinct operating conditions exist; one calling for the use of a constant-speed motor, the other for a motor of the variable-speed type. Where direct current is available these conditions are easily met, the variable-speed feature being obtained by means of field control.

On the other hand, owing to the simplicity of construction, an alternating-current motor of the squirrel-cage type is the logical choice for constant-speed duty, and its adoption in so many shops is largely a result of its special adaptability for such service.

The pronounced economy of variable-speed drive is of course due to the fact that the proper cutting speed can be applied to any job. This naturally increases the rate of production and insures better and more accurate work. A controller located conveniently to the operator in such a manner that the variation from minimum to maximum speed can be made with great facility, affords a ready and positive means of obtaining the maximum output for which the tool is designed.

In some instances attempts have been made to obtain variable-speed application with alternating-current motors by the use of a system of gears. It is obvious, however, that any gear-box arrangement cannot be so convenient or easy of manipulation as a motor controller, which also permits of finer gradations of speed.

One of the most interesting applications of a direct-current, variable-speed motor, is for use with a planer. The motor in this particular case is required to be reversible, and preferably with ratio of three or four to one. The machine is usually coupled direct to the driving shaft which is the pulley shaft of the planer. This method of connection does away with all pulleys, shifting mechanism, belts and overhead work of every kind. Instead of the belts shifting and reversing the pulleys, the motor is automatically stopped, reversed and started again as quickly as can be accomplished with the ordinary belt-shifting planer.

On the side of the planer bed, usually in front of the shifting mechanism, is placed a transfer switch, so connected that the table dogs throw this switch instead of shifting the belt. This changes the direction of the current, and a special controller used with the motor shuts off the current and then permits the motor to operate as a generator, which sets up a dynamic effect, bringing the motor to a dead stop. The current is then reversed and the motor brought up to full speed. Two hand controllers are also required for this duty, one for varying the cutting stroke and permitting any cutting speed from 25 to 60 feet to be obtained; the other for the return stroke which can also be varied between the limits of 50 and 100 feet. After these hand controllers are once set they remain stationary, the speed variations being maintained through resistance coils so that all parts are non-movable.

One of the principal advantages of this drive is in the fact that a motor much smaller than usually employed can be used, there being no large-diameter pulleys with large flywheel inertia that require to be stopped and reversed.

This drive is particularly adapted for large planers where the gear ratio is high, and permits a more constant short stroke than could be obtained with belt drive.

The absolutely sparkless operation of direct-current variable-speed motors constitutes one of their most important features and is primarily due to the commutation-pole design. The construction is very similar to that of the constant-speed motor, with the exception that commutation poles bolted to the field yoke are placed midway between the main field poles. The winding on the interpoles is in series with the armature, so that the strength of these poles depends upon the load on the motor and is therefore proportioned to the armature reaction. This is true irrespective of the direction of rotation, so that the points of commutation are always in a field of such magnetic strength that sparkless commutation at all loads and all speed variations is obtained. This method of construction also permits heavy overloads to be carried with ease and safety.

Other advantages of the commutation-pole type of motor are (1) less heat generated in the commutator; (2) higher efficiency due to the lower core loss and reduced commutator loss.

Generally speaking, the amount of power wasted in driving line shafts and counter shafts averages from 30 to 50 per cent. With the use of individual motor drive this waste of power is entirely eliminated. Each machine will draw power from the line only when in actual operation.

The use of direct drive permits each machine to be placed just where it is wanted without reference to the layout of any line shafting. This naturally results in an increased output due to the added facility of handling the work thus obtained. The arrangement also permits the location of tools to be changed at will, and additional tools can also be readily added from time to time.

In most modern shops all tools, especially those of the larger size, are served by overhead traveling cranes. The use of individual motor drive, with its entire freedom from overhead shafting, hangers and belts, greatly simplifies this work. Finally the entire absence of overhead shafting, moving belts, etc., greatly adds to the cleanliness of any shop.

Increased light and freedom from grease and dust bear directly upon the output per man, increasing the quality and quantity of his work.

Lehigh Company Inaugurates Immense Power-Plant Project.

The recent execution of a contract by the Lehigh Navigation Electric Company, Philadelphia, Pa., with the General Electric Company, for three 10,000-kilowatt, 11,000-volt, three-phase, 25-cycle, horizontal turbogenerator units with exciter sets, to be installed in its new main generating station at Hauto, Carbon County, Pa., inaugurates one of the largest electrical power projects since the building of the Niagara Falls power plants. Preliminary reports of this undertaking have appeared heretofore, and an investigation of the commercial and engineering feasibility of the undertaking has been in process under the direction of W. A. Lathrop, president of the company, and Lewis B. Stillwell, consulting engineer, since its inception in 1908.

Aside from the size of this work for the centralization of power generation and distribution, which contemplates an initial expenditure of $3,000,000 and definite plans for an eventual investment of $10,000,000, with an assured supply capacity of 20,000 kilowatts from the first installation and a gradual enlargement to 100,000 kilowatts ultimate capacity, it represents the beginning of the most important step toward the economic use of coal and on a tremendous scale directly at the mines that has ever been taken in the United States.

Hauto, the site of the central generating station, is located about ten miles west of Mauch Chunk and is at the mouth of a railroad tunnel leading from the main body of anthracite coal owned by the Lehigh Coal & Navigation Company at Lansford. From here the distribution of current for heat, light and power by means of high-voltage transmission lines, reaching out through Eastern Pennsylvania and New Jersey, will penetrate a territory with 2,500,000 population.

By transforming the latent energy of coal into electrical energy at the mines and transmitting this to consumers, one of the biggest factors that enter into the cost of coal—the handling of it—will be eliminated. The company figures that still another economic saving will be realized. At present, it has a waste product of about 500,000 tons of coal a year. This consists of coal particles and dust which pass through fine screens. All this culm is entirely unmarketable and will be handled so as to be burned in the company's boilers.

The location of the main generating plant at Hauto was also determined because of an abundant water supply. An existing reservoir is being increased to a storage capacity of 1,000,000,000 gallons and an area of about 400 acres by the construction of a higher dam. The water needs of the ultimate plant will be some 300,000,000 gallons a day, most of which will be carried back into the reservoirs after condensation. To run the plant up to the contemplated maximum installation of 100,000 kilowatts capacity, it is estimated that 1,000,000 tons of coal a year will be needed, a quantity of anthracite which would require 20,000 of the largest cars to transport to market.

Among the first power consumers in the district, it is planned to supply the slate and cement industries in Lehigh and Northampton counties, all of which are in a territory from 20 to 40 miles distant from the Hauto plant. Substations will probably be established at once at Coplay and Pen Argyl for stepping down and distributing the current to users. Within a radius of 50 to 75 miles from the main station there are about 20 large cement mills. The transmission lines will be strung largely along the Lehigh Navigation Canal and on the right of way of the Lehigh & New England Railroad, which the company controls.

With the assistance of these companies a complete power census of the industries has been taken, and within the district which will be reached by the distribution system of the first section of the Hauto plant, over 100,000 horsepower is being used now. The Lehigh Navigation Electric Company has made up a schedule of prices, running from 0.8 up to 2.5 cents per kilowatt-hour, according to the amount of power contracted for and the steady continuance of consumption. This is lower than the cost at which the industries are able to produce steam power.

Under the laws of Pennsylvania the right of an electric power company operating with steam to distribute energy is confined to a single township; accordingly, charters have been obtained in Lehigh, Schuylkill, Carbon, Northampton, Bucks and Montgomery counties for about 60 electric companies. The first electric companies organized for each township are in Lehigh County, and consist of the Hazard Electric Company for Hanover, Oakdale Electric Company for Salisbury, the South Whitehall Electric Company for South White, the Equitable Electric Company for Whitehall, the North Whitehall Electric Company for North Whitehall, the Diamond Electric Company for Washington, the Upper Macungie Electric Company for Upper Macungie, and the Upper Millford Electric Company for Upper Millford. All subsidiary companies will be consolidated under the management of the Lehigh Navigation Electric Company.

With the exception of the 8,000-kilowatt plant of the Harwood Electric Company, which supplies current for lighting and electric railway operation around Hazelton, using coal direct from its own mines, no attempt has been made heretofore in this part of the country to generate electric current for public service. The Lehigh Navigation Electric Company expects to have the first installation at the Hauto plant in operation before the end of the year. As the capacity of the plant is gradually increased, energy will be carried to Allentown and Easton, Pa., Trenton, N. J., and undoubtedly finally into Philadelphia. This city is within 80 miles and New York City is only 105 miles distant.

Electric-Sign Business in San Diego.

On December 1, 1910, there were on the lines of the San Diego (Cal.) Consolidated Gas & Electric Company 69 electric signs containing 5,706 lamps with a connected load of 53.2 kilowatts. On December 1, 1911, the total number of signs had increased to 175, with 12,391 lamps and a connected load of 133.1 kilowatts. Thus there was a gain in the number of signs of 154 per cent, in the number of lamps of 117 per cent, and in connected load of 150 per cent. The number of signs on flat rate on December 1, 1911, was 96 and on metered rate 79. The sign business for 1912 is reported to even exceed these figures.

POINTERS FOR CENTRAL STATIONS.

By R. H. Pickens.

In all power stations there should be a blue print posted in a conspicuous place, showing connections of all apparatus; each lead and connection should be plainly numbered on this blue print and the corresponding number on a small lead or fiber tag should be securely attached to the lead or connection.

All attendants should be thoroughly familiarized with the connections of the apparatus and instructed as to the different combinations possible in the event of failure of any of the apparatus, in order to assure continuance of service.

The men attending the switchboard should be selected with the idea of obtaining those who are not easily excited or lose their heads in the event of failure of any of the apparatus. Attention to this point will often save valuable apparatus and prevent the damage in one piece spreading to others.

When starting up an alternating-current plant after a short-circuit or shutdown, much valuable time can be saved if the main switches of the generators are closed first; then close the field switches, after which slowly build up the exciter current, meanwhile keeping a close watch on the generator ammeters in order to prevent excessive cross currents. In this way paralleling can be accomplished very quickly.

In all plants a periodic inspection of bearings should be made at intervals of at least every hour. This may seem an unnecessary precaution with modern bearings but it will often prevent an expensive and annoying shutdown of a unit due to burned-out bearings, as many things can happen to a bearing that would result in a burn out in the course of an hour.

Several inch planks of hardwood, about 8 feet long and 12 inches wide, should be kept in the generator room in a perfectly dry place. They are useful to stand on while making low-voltage connections that are sometimes necessary on the board or exciter circuits and will prevent unpleasant shocks.

Oily waste should be kept in air-tight metal cans, as certain oils, when disseminated through waste, readily oxidize by combining with the oxygen of the air and this combination can, under certain conditions, take place rapidly enough to raise the temperature of the waste to the ignition point.

Some form of chemical fire extinguisher should be kept in the generator room, preferably one with a liquid extinguishing material that can be thrown upon the armature coils of high-voltage generators, without danger of shock to the attendant;

this will prevent the flame of burning insulation, fanned by the blast of the rotor, from spreading to other coils that are otherwise undamaged. Never make use of the ordinary form of extinguisher, charged with an acid or alkaline solution, in attempting to extinguish the flames of high-potential apparatus.

It is best that oils and grease be kept in metal containers and not be allowed to remain in the wooden barrels they are received in, as is the practice in some stations.

Extra coils, tapes, shellac, etc., should be kept in a convenient cupboard, preferably made of sheet metal. Each item should have its own separate receptacle or shelf and items belonging in one space should never be placed in the space devoted to others. Everything in this cupboard should be so arranged that any item in it could be found in the dark, if need be.

Scrupulous cleanliness should be observed down to the minutest details.

Last, but not the least, every man about the station should be impressed with the importance of keeping everything shipshape and ready for any emergency.

Tensile Strength of Electrolytic Copper.

A paper was presented by C. W. Bennett at the recent convention of the American Electrochemical Society entitled "Tensile Strength of Electrolytic Copper on a Rotating Cathode."

This paper described apparatus for obtaining samples of metals and alloys by precipitation on a rotating cathode with high current-density. The cathode can be driven by an electric motor at a rate of 6,000 revolutions per minute and carries 300 amperes, operating continuously under these conditions. About one horsepower is required at this speed when the cathode is immersed five inches in the electrolyte. A current-density of 3,500 amperes per square foot can be attained when four inches of the cathode is receiving a deposit. The metal can be removed without subjecting it to strain or heating. In a second paper experiments were described showing that the tensile strength was increased by rotation of the cathode during deposit. This was to be expected, since rotation decreases the size of crystal, which is the effect obtained by such processes as rolling. It was found that the crystal size decreases as current-density increases and as the temperature falls. If the precipitation is carried on at a high temperature an effect similar to annealing is accomplished during electrolysis. A good deposit of copper could apparently be obtained with any current-density no matter how great, if the stirring were efficient enough to prevent impoverishment of the electrolyte. "Hard-drawn" copper can be deposited on a rotating cathode at almost any current-density if the temperature be kept down. Electrolytic copper was obtained with a tensile strength of 68,000 pounds per square inch. In the precipitation of alloys acid solutions with readily soluble salts should be sought.

This paper was discussed by Carl Hering, H. D. Hibbard, W. D. Bancroft and C. G. Schluederberg. Dr. Hering suggested that by using a larger diameter, a lower rate of rotation would give the same linear velocity to the surface of the cathode. Similar results can be obtained by moving the liquid instead of the cathode. Mr. Bennett replied that this would reduce the current-density which would result in larger crystals. Thus when a conical cathode is used the current-density is highest at the point of the cone and the largest crystals are formed there.

THE ANNEALED COPPER STANDARD FOR WIRE TABLES.

International Value Recommended by the Bureau of Standards.

A report on copper wire tables has been made by the Bureau of Standards, Washington, D. C.

The introduction states that copper wire tables are based on certain standard or assumed values for the conductivity or resistivity and the temperature coefficient of resistance of copper. When accuracy is important, the electrical engineer does not consult the wire table, but makes actual measurements of the resistivity of samples of the copper used. Frequently the resulting conductivity is expressed in per cent of the standard value assumed for conductivity. Per cent conductivity is meaningless without a knowledge of the standard value assumed, unless the same standard value is in use everywhere.

But the same standard value is not in use everywhere, and confusion in the expression of per cent conductivity has accordingly resulted. The temperature coefficient of resistance is usually assumed as some fixed standard value, but the same standard value is not in use everywhere, and results reduced from one temperature to another have accordingly been uncertain when the temperature coefficient assumed was not stated. These conditions led the American Institute of Electrical Engineers to request the Bureau of Standards to make an investigation of the subject. This has been done and has resulted in the establishment of standard values based on measurements of a large number of representative samples of commercial copper—values which in certain respects are more satisfactory than any preceding standard values.

In the investigation it was discovered that the temperature coefficient is proportional to the conductivity. This new law has been corroborated by the Reichsanstalt, of Germany, and is of considerable importance in electrical measurements. It was also discovered that bending and winding a wire do not change the temperature coefficient, and consequently the internal temperature of electrical machinery may be calculated from resistance measurements with greater confidence than heretofore.

A proposal from Germany of a standard conductivity based upon this investigation has been accepted, and will probably soon be adopted all over the world. This new standard is a slightly lower conductivity than the former American value and the average of the experimental values published by the Bureau of Standards, but can be considered as substantially representative of average commercial copper.

This report gives a history of wire gauges, showing that the trend of practice is toward expressing diameters directly in decimal fractions of an inch. The report contains 15 tables, including complete reference and working tables for annealed copper, both in English and metric units. Tables for copper cables and for hard-drawn aluminum wire are also given. The tables have been adopted as the official wire tables of the American Institute of Electrical Engineers.

Wireless in Government Possessions.

It is stated that the United States Government has planned to spend $1,000,000 for wireless-telegraph equipment on the Ismuth of Panama and to put all wireless in the Canal Zone under the control of the United States Navy. Arrangements will be made with the Republic of Panama to prevent any private or commercial companies from establishing stations in that country. A high powered station will be erected about midway between the Pacific Ocean and the Carribean Sea, and it is expected that connection will be had with stations at Washington, Brooklyn, and Guantanamo, Cuba.

The Senate Philippine Committee has reported a bill to establish a system of wireless telegraphy in the Philippine Islands. The bill appropriates $150,000 for the construction of stations and provides that the system be maintained by and under the control of the insular government.

In case of a deficit in operation, such deficit it to be equally divided between the governments of the United States and of the Philippines.

THE ETHER.[1]

By P. G. Nutting.

The whole of theoretical ether-physics has been profoundly modified within the past two decades. Many of the fundamental concepts of electricity, gravitation, radiation and even matter itself have been revised from their foundations. Our task today is to examine the storm center, the ether. In anticipation, it may be stated that the task will prove not to be a mortuary one, but rather one of removing and getting rid of rubbish. The new ether is the old ether freed from useless and incongruous attributes.

What we wish to know about the ether is whether it exists or not, what are its nature and properties, and what are its relations to electricity, gravitation, radiation, induction and chemical affinity. Material bearing on these problems is scanty and we can do little more than review the experimental facts and their interpretation, contrasting their present interpretation with that of twenty years ago and placing in their proper setting the more recent important discoveries.

First then as to the *existence of the ether*. We shall discuss first the evidence in favor of an ether and then sum the evidence against it. The older reasons for supposing the existence of the ether hold as forcibly today as they ever did and to these have been added a few new ones of some significance.

(1) There is the old question of *action at a distance*. Wherever two objects are attracted toward or repelled from each other and there is no material connecting link, such as a wire or pulsating fluid, between them, it has always been customary to put the burden upon an immaterial medium. Gravitational attraction, electrical and magnetic attraction and repulsion are of this nature. Chemical affinity should probably be included but some hold that a material link actually holds the atoms together.

In my opinion not much weight can be attached to action at a distance as evidence for the existence of an ether. The assumption of an ether is doubtless the *simplest* explanation of the facts, but it is certainly not the *only possible* explanation. It is easy to imagine an intervening medium pulled by one body and itself pulling a second body. However, in imagining such a medium, we are endowing it with mechanical properties and with such extreme properties as no known material possesses. In discarding the mechanical assumption we may either assume a non-mechanical ether or else assume that these forces really belong to some higher mechanical system in which the apparent action at a distance is in reality contact action. Perhaps there are still other alternatives. I merely cite these two to show how far we are from a final disposition of the problem.

(2) The *propagation of electromagnetic energy* from one body to another. Radiation is emitted by one body and received after an interval of time by another. Where and what was this energy during that interval of time? Until recently, these questions were readily answered; radiation travels as wave energy, where waves are there is *motion*, where motion is there is something that *moves*, namely, the ether. At present with an ether devoid of mechanical properties, there are wide differences of opinion as to just how electromagnetic energy travels through space, but if we knew how it is propagated through any material dielectric, we could very probably give at least a tentative explanation of how it travels from one body to another.

So far as we now know, such energy could be propagated through *void* space only in corpuscular form. If we assume corpuscular light, we have to contend with a solid array of firmly established facts. Further, electromagnetic theory itself shows that energy thus propagated is essentially *alternating* in character and in definite relations to the direction of propagation. To my mind, all the evidence afforded by the propagation of radiation through space is against that space being void and in favor of an ether with very definite electric and magnetic but without mechanical properties.

(3) A third group of evidence bearing on the existence of the ether consists of those phenomena indicating a storage of energy in the neighborhood of an electric charge in actual motion. These phenomena correspond with self-induction in the case of ordinary electric currents. Cathode-ray particles, the beta particles from radium and similar objects carrying electric charges with high velocities, carry more energy than corresponds with their material mass and velocity, electromagnetic energy and the adjacent medium. This may even be separated from the matter and charge and measured as energy in the form of Rōntgen or of gamma rays.

These phenomena, to my mind, supply the most direct evidence of the existence of a medium. If there were no medium how could a moving charge carry or conduct along with itself, *outside itself* energy of motion? How could a bullet moving in void space possess energy of motion exterior to itself? It may be thought that the assumption of lines and tubes of force as physical entities would provide an escape from the assumption of a medium. But such an assumption merely displaces the dilemma. If we consider that the region adjacent to a moving charge is filled with actual tubes of force instead of merely being an electromagnetic field, how, without a medium, could the sizes and shapes of these tubes be a function of the velocity of the charge?

(4) To most of us it is a significant fact that not one of those whose work has been largely instrumental in the overthrow of the mechanical theory—H. A. Lorentz, Poincarè, Planck, Larmor, J. J. Thompson, Schuster, Whittaker, Heaviside, Weichert, or Michelson—appears to question the existence of an ether *without* mechanical properties. The no-ether school may fairly be compared with the no-atom school of energetics. If we ignore the ether or the atom we may treat a considerable portion of physics quite satisfactorily but we must ignore a great many vital and significant phenomena in so doing.

The evidence *against* the existence of the ether falls into two distinct classes; it is either evidence against the *mechanical* theory or else evidence based on the negative results of attempts to detect ether drift. In the last analysis these two are the same but we shall discuss them separately.

The mechanical theory never did have high standing with thinking men, and but for the support of a few leading physicists having mechanical minds, would never perhaps have been developed beyond a mere tentative hypothesis. We have no reason to think that even Lord Kelvin himself, chief exponent of the mechanical theory, ever considered it more than such a working hypothesis.

We are all familiar with the character and properties assigned to the mechanical ether; its enormous elasticity and infinitesimal density to give the proper value to the velocity of light, its enormous tensile strength to support gravitational forces, its solid properties to propagate transverse light waves, its fluid properties to permit heavenly bodies to move through it with fixed velocities, and so on. The mechanical ether reached its highest development as a vortex sponge at the close of the last century. It has passed away, not by violence but by starvation. It always was a monstrosity and we are only too glad to be able to discard it forever.

The stubborn refusal of all phenomena, both natural and artificial, to show any indication of absolute motion in space has no direct bearing on the question of the existence of an electromagnetic ether.

The Lorentz contraction hypothesis with the electron theory of matter, offers us one loophole of escape from the stubborn facts, the relativity theory several. It is too early to say what will be the outcome, into what framework of theory our experimental facts will fit with least violence to themselves.

Some relativists would have us reject the ether entirely on the ground that it is useless. I, myself, fail to see how it

[1] Address at the Bureau of Standards, Washington, D. C., February 5, 1912. From the *Journal of the Washington Academy of Sciences*.

can be dispensed with, any more than atoms or molecules can be dispensed with, nor how anyone, at all versed in theoretical optics or electricity, can consider it unnecessary.

In short, the mechanical ether of Kelvin, Lodge and Helmholtz, the ether most of us were brought up on, has been proven untenable, the electromagnetic Maxwell ether stands just where it always stood. It has been attacked, without much effect, by the extreme relativists, strengthened by the electron theory and brought into prominence by the pruning away of the mechanical theory.

As the conservation of energy is the simplest general principle which will make perpetual motion impossible, so the simplest physical law that will permit of discarding all the mechanical attributes of the ether is the principle of relativity. Both of these principles are, however, but limited forms of more general laws.

Three classes of physical phenomena may take place within or across space void of matter:

(*a*) *Forces* may *act*. Electric, magnetic, gravitational (and possibly chemical) forces act across space even when no matter intervenes. Electric and magnetic forces may be either positive or negative, gravitational and chemical forces are negative only. The signs of these forces can not be altered by any intervening medium. Electric forces are a maximum when no matter intervenes. Magnetic forces are intermediate in value while gravitational force is the same whatever the intervening medium. The speed of propagation of electric and magnetic forces across space is a finite constant independent of the sign or magnitude of those forces. The speed of propagation of gravitational forces is certainly greater than 10^{13} centimeters per second and probably infinite. In no case is there any evidence of a force too small or too great to be propagated; that is of any finite maximum or minimum load. In other words, there is no evidence that the ether, if the ether be responsible, has any finite inertia or viscosity on the one hand or breaking strength on the other, certainly not in any mechanical sense.

(*b*) The absence of matter is no bar to *induction*. An electric charge induces an electric charge as readily across a vacuum as through matter, and similarly with magnetic and electromagnetic induction. Induction is always of the same sign, unlimited in magnitude and propagated with the speed of light.

(*c*) Electromagnetic radiation is propagated across a vacuum as freely as through matter. Beams of light and electric waves, whatever their nature, travel independently of each other, i. e., no matter how filled with radiation of *one* kind and direction a certain space is, neither the wave-length, velocity, direction, damping or polarization of any other beams traversing the same space at the same time is in any way affected. Neither electric nor gravitational *strain* of any amount produces birefraction in a space devoid of matter nor does a magnetic field affect the *plane of polarization* unless matter be present. That these effects do exist in matter indicates an actual mechanical strain. Of the two astronomical methods for determining the velocity of light, the satellite method gives the *group* velocity, while the aberration constant gives the *wave* velocity; the close agreement between the values obtained indicates that wave and group velocity is the same, hence that there is *no* dispersion in space, waves of all frequencies traveling with the same velocity.

Two important facts give us clues to the actual magnitudes of the constants of the ether: (*a*) the fixed finite nature of the velocity of propagation (independent of the motion or intensity of the source) indicates definite electrodynamical properties in the space traversed. (*b*) Again, space has a definite fixed *capacity* for radiant *energy*, a function of the frequency of the radiation, its spectral distribution, the velocity of propagation and the amount already present. Expressions for what correspond with entropy and specific heat may be derived without difficulty. This capacity for energy is dependent upon boundary conditions while the velocity constant is *not*.

There exists rather conclusive evidence that short-wave and pulse electromagetic energy is emitted in even multiples of a small but finite quantity proportional to the frequency. On the other hand there is no evidence that such is the case with the long waves of wireless telegraphy. However, it does not follow that even light waves or gamma rays are necessarily propagated in space in these discrete units. A spherical wave or pulse may be subdivided radially by an absorbing screen, a lens or a mirror; tangentially by partial absorption or reflection or by double refraction and there is no evidence of any limit to the attenuation a pulse or wave may suffer during propagation.

To summarize the properties of the ether we may say that it has no *mass* and no *rigidity* in the mechanical sense and that its parts have no *identity*. Having no mass it can have no *density*, having no rigidity it cannot be subject to *strain*. The ether does, however, possess electromagnetic properties analogous to each of these.

Having no identity, its displacements and velocities, if it has any, are unknown to us. Tagging the ether with electromagnetic disturbances is, as we have seen, ineffective. The core of the matter is this. What kind of a medium can have *real tangible* forces acting at its boundaries and conduct real energy with a finite velocity and yet itself have no inertia or rigidity in any mechanical sense?

Two of the many possible explanations are suggested. (1) The properties of the ether may be mechanical after all but in four dimensions. If this be the case it is for the mathematical physicist to work out the solution of the problems of gravitation, induction and radiation; it would be useless for the experimental physicist working in three dimensions to seek a solution. (2) The properties of the ether may be non-mechanical of unknown nature. In this case, it is for the experimentalist to find out the nature of electricity and ponderomotive electrical effects. The four dimensional mathematical method appears to be the only one capable of attacking the gravitational field; yet we feel instinctively that the final solution *must be* physical and three dimensional.

Electric Deposits in Flames.

Some peculiar phenomena, recalling electrolysis of solutions, have been described by Bruno Thieme, of Berlin, in the *Zeitschrift für Physikalische Chemie*. He places two copper wires in the sooty flame of a burner or candle, the one wire above the other, about 1 centimeter apart. Both become black with carbon. When they are joined to a battery, however, the carbon deposit forms a growth, a kind of trunk, from which fine branches extend into the flame, on the cathode, as soon as the potential difference exceeds 12 volts. It is of no use to raise the potential above 25 volts, however, and the phenomena are hardly more pronounced in the much more sooty acetylene flame than in an ordinary coal-gas flame. When the current is reversed, the carbon particles separate off, and appear at the other electrode. The soot is very fine and soft, and Thieme, therefore, designed an apparatus for the continuous production of such soot. For this purpose he uses a long flame produced by letting the gas escape from a series of holes in a horizontal tube; in these jets he suspends a horizontal wire, and above this a piece of wire gauze. The wire is attached to an electromagnetic relay which attracts and shakes the wire as soon as the carbon deposit reaches over to the wire gauze and short-circuits the current. Other experiments were made with an influence electric machine or with an induction apparatus as source of current; the passing spark caused the deposition of carbon, sometimes, however, at the anode. While, therefore, the phenomena on the whole resemble electrolysis, and also the transference of carbon particles from the electrodes by and through the carbon arc, there are peculiar anomalies which Thieme will study further.

Electric Conduction.

At the recent convention of the American Electrochemical Society at Boston, a symposium upon the subject of electric conduction was held. Two of the most interesting discussions were those by D. F. Comstock and E. Weintraub. Professor Comstock spoke as follows:

From the modern point of view we have to consider only three fundamental realities which go to make up the structure of a piece of matter as we see it; the atoms, the electrons, and electromagnetic energy. To summarize briefly the state of belief with regard to these three entities: We now know about 100 different kinds of atoms, the heaviest atom is about 240 times the lightest in weight, and is about 16 times the volume of the smallest. That makes the radius about three times as great. From the modern point of view the atom is by no means the simple object which we have thought it. Professor Rowland wrote that beside an atom a grand piano is a very simple affair and modern research has certainly borne that out. The electron was discovered by J. J. Thomson in 1896 or 1897, and the electron is the ultimate unit of electric charge and must be considered as very much smaller than the atom. It is very difficult to see how it can possibly be much smaller, but it is said to be 10^{-13} of the atomic diameter, or proportionately something like a pinhead to an office building. It is important to realize the enormous difference in size between the atoms and electrons, if the mutual relations of the two are to be understood. Electrons, so far as we know, are only of the negative kind, no positive electrons being yet known. The other fundamental reality, energy, is in a certain sense very much more mysterious, and it has a power of impressing you with its reality, which power is becoming greater and greater. Radiant energy leaves the sun eight minutes before it reaches the earth. It has no forerunner and on the other hand it has no trail which it leaves behind it. It seems to be a definite isolated reality which is localized in space during these eight minutes. We know that it is conserved, moreover, and cannot be created and destroyed. Again, we know that radiant energy pushes on any surface which absorbs it or reflects it. So that radiant energy has momentum when it moves. It is very much indeed like matter in its action; it comes from a great distance with a high speed and hits the surface, bounces back and is absorbed by the surface, and exerts a pushing effect on it. Radiant energy can also be definitely localized in the ordinary sense of the word. It can be at a certain place in the enormous distance which it travels at any given instant. So that radiant energy, although perhaps very mysterious, in that it is not just like matter, certainly resembles matter in a good many ways.

These three entities are the only three that we have at our disposal, apparently, for building up our model of the physical world. We are, of course, neglecting gravitation. Gravitation is of a smaller order.

Any modern theory must express itself in terms of atoms, electrons or energy. We are forced to believe that the atoms of solids, liquid and gases are in constant vibration. In the case of gas molecules, which are so far apart compared to their size, the molecules move in straight lines until they hit another molecule. Molecules must be considered elastic. It is not an artificial assumption because the lack of elasticity in an ordinary substance means that when it is compressed part of the energy which you use in compressing it goes into the molecular or atomic energy of vibration; so that frictional forces correspond to the creation of atomic energy, and you could not say, and have any meaning in your statement, that the atoms are inelastic and have friction. That would imply that the mass of energy would have to go into something smaller inside of them.

The space between the atoms, in an ordinary piece of matter, must be of the order of magnitude of a tenth or a fifth of the atomic radius, and as a body shrinks due to the removal of the energy or vibration of the atoms, these holes diminish in volume until you have, at the absolute zero, no motion and no space between.

The positive electricity does not appear as electrons; it is always associated, apparently, with the atoms; consequently the charging of an atom negatively means that you in some way succeeded in getting another electron on it, or atoms have some attraction for electrons apparently. Charging an atom positively means that one of the electrons which it contains is taken out of it, leaving it, therefore, under the domination of the mysterious positive electricity which always remains in it. Consequently an uncharged atom must be considered as an aggregate of a large amount of positive electricity combined with a number of electrons which, in the aggregate, completely neutralizes the positive electricity. A great many of the properties of the atoms can be interpreted in terms of their attraction for electrons.

With regard to charging a body or passing electric current through metal: if you charge a piece of metal negatively, it means putting some negative electrons on it. The relative amount that you can add compared with the electrons already on it is very small. Electrification by induction is, of course, to be considered merely as a separation: the electrons in the body can move freely.

Now, in the case of the insulator, if you put a positive charge near it, there is precisely the same tendency for electrons to move. However, in the insulator, presumably, the electrons cannot get out of the atom, and what they do is simply to shift their position slightly out of the atom. On the average you have about ten to twenty million electrons per cubic centimeter, and this enormous number will have to move an extremely small distance, only one-tenth of the atomic diameter, to produce the large effect which corresponds to the appearance of the charge on the surface of the dielectric.

If you have a conductor which has open ends, free ends here, and you set up the electric force in it, of course the electrons will tend to move along through, exactly in the same general way that we found that the ions moved in an electrolyte, with this important difference, that in the electrolyte we have both ions moving, whereas in this case we have the positively charged atoms; that is, the atoms abandoned by an electron, remaining in the same position and the electrons move. Consequently, whatever is moving in the wire is probably the electrons, and it happens to be in the opposite direction to what we call, for historical reasons, the direction of the current.

What you have traveling with an enormous speed is not the electrons, but the impulse to move, just as when we pull on a long rope; after pulling the rope, in a brief interval the other end is jerked, showing that there is a force which is propagated with enormous velocity, whereas at no time may the rope be moved faster than a foot a second. Similarly the impulse of the atomic motion travels quickly, but the actual atomic motion must be very slow. We can say in general that the conductivity of any substance is not the conductivity corresponding to the current-density for a unit voltage, but the conductivity must depend on the number of electrons or ions, and the charge they have on them, and the frictional resistance. Strictly speaking, the conduction of current does not exist. All currents are convection currents, with the exception of the thing which is called the displacement current.

E. Weintraub gave a general review of the conductivity of solid elements, solid solutions and compounds. He showed that all the solid conductors can be divided into two classes, good conductors and poor conductors, characterized by different magnitude of resistivity, different law of variation of the resistivity with the temperature and by different behavior of the solid solutions. The metals belong to the first class; silicon, boron, and most compounds to the second. The relation between electrical conductivity and other physical properties, such as thermal conductivity and specific volume was then treated. In good conductors when each property is varied within a small interval simple relationships are exhibited. In poor conductors these relations do not hold at all. The speaker emphasized that the present electronic theory of conduction in solids is too simple to be able to explain the complex phenomena. Outside of a partial agreement between theory and experimental evidence in the parallelism between heat and electrical conductivity, the theory has not been able to explain even the simplest observed irregularities. The law of variation of conductivity with temperature, the disappearance of the resistance at absolute zero, the manner in which the electrical conductivity depends on the volume, have not been accounted for by the electronic theory. According to the speaker, a better knowledge of the internal structure of metals and other solids is necessary before a satisfactory theory of electrical conduction can be hoped for.

Production of Mica.

The total value of mica produced in the United States last year amounted to $355,804, but the imports were valued at $502,163. These imports, however, were less by $222,362 than those of 1910.

The principal mica-producing countries are India, the United States, Canada, Brazil, Ceylon, and South Africa. In the United States mica deposits have been found in more than 20 states.

New Electrical and Mechanical Appliances

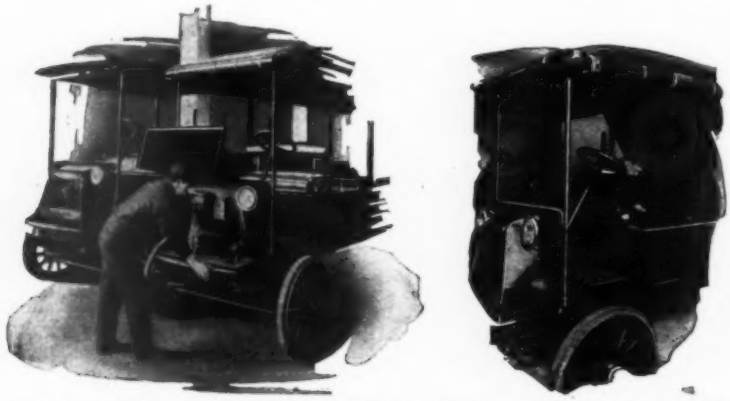
An Electric Truck Designed to Secure Great Accessibility.

Accessibility for inspection and care is the keynote of the latest design of electric truck developed by John M. Lansden for the General Motors Truck Company, of Detroit, Mich. The controller, safety switch, ampere-hour meter and lamp circuits are all placed in the hood at the front of the machine and are instantly accessible by raising the hood, which is conventional in design and construction, thus adding greatly to the appearance of the chassis. This location alone means a great deal to the garage man because the controller has been so placed that adjustment and inspection of each finger is very readily made. All connections are in plain sight and are not unhandy to the caretaker.

Another original and almost radical feature is placing the battery on top of the frame under the driver's seat. This eliminates absolutely the usual arduous labor associated with disconnecting and withdrawing the batteries, thus saving on all large-sized machines several hours weekly and practically removing all possibility of accident by the dropping of battery crates, short-circuiting due to hanging leads, etc. Furthermore, as the battery is in plain sight, the caretaker does not have to work through a trap door or around corners to get at the cells. Battery manufacturers are enthusiastic about this feature, for it means that the battery can now be given the very best possible chance for care; not only is upkeep and inspection made easy but the battery is free from the usual dirt and drip from any load carried in the body proper. It is also properly ventilated in summer and protected against excessive chilling in winter.

It has been contended by some that such a design introduces too great a length to the machines, but it is a generally accepted fact that in gasoline trucks (of the smaller load capacities, at least) the foreign practice of placing the engine under the hood is correct, and what the American buyer now demands. As these machines are invariably longer than the G-M-C electric, it follows that this question of length is superficial at best. The main question with every operator is not necessarily the over-all length of his truck, for the circle within which the wheels will turn is of more importance and, on account of the G-M-C narrow frame, this is kept at a minimum, the turning circles being entirely favorable for equal loading spaces. Moreover there is not one driver in twenty who will not use the battery box cover as loading space.

The General Motors Truck Company reports orders in quantity from some of the largest and oldest users of electric trucks which may properly be considered as a general indorsement and appreciation of its design.

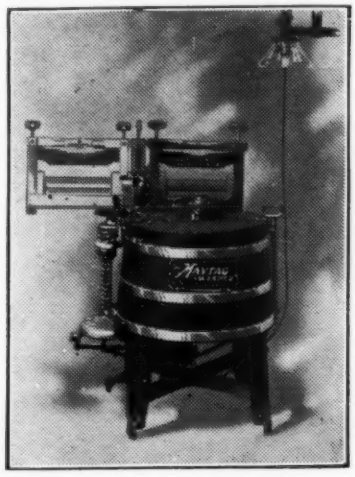


G-M-C Electric Truck, Showing Accessibility of Controller, Switchgear and Battery.

The Maytag Electric Washer.

A number of valuable features have been added to the electric washer manufactured by the Maytag Company, of Newton, Iowa. Most distinctive among these is the swinging wringer. This permits clothes to be washed and wrung at the same time without trouble or danger of damage to the clothes. On ordinary machines this cannot be done without holding the clothes above the oily mechanism on top of the tub, thus running the risk of tearing or at least soiling them.

The gears are entirely inclosed and the motor and driving mechanism are placed out of the way. The clothes agitator adjusts itself to the amount of clothes in the tub and is so constructed that it does not tear or strain the finest silks, laces or other fabrics. The legs of the washer are integral with the tub, being merely extensions of four of the staves; they are well braced and give the machine a substantial base free from vibration without any bolts to get rusted. The tub itself is high-grade clear southern cypress and not liable to leak.



The Maytag Electric Washer.

A three-inch pulley is provided on the motor shaft on which a belt may be run to operate an ice-cream freezer, food chopper or other useful household appliance. All the metal parts of the machine have a rustless finish. The electrical energy consumption is low and the general economy and labor saving very marked. The clothes are thoroughly and quickly washed without injurious wear and tear and with practically no effort. Other duties may be attended to while the washer quietly does its work. With all these advantages the Maytag washers are low in initial cost and upkeep and are liberally guaranteed.

The Nosplice Wire Connector.

The disadvantageous features of soldering and taping joints are understood by every electrical man. In order to solder and tape wires it is necessary to provide the electrician with the following: solder, grease, fuel, torch and friction and rubber tape. Aside from the burden of keeping on hand a stock of soldering paraphernalia, in order to solder and tape a joint it is necessary to first scrape and twist the wires together on a number of outlets, then light a torch and return to each outlet for the purpose of soldering. When this is done a man must again return in order to tape the soldered joints. In most cases a ladder must be moved back to each outlet three times.

Aside from the time wasted and the blackening of many ceilings, it can be readily seen that should a man solder and tape a few joints a little carelessly,

Fig. 1.—The Nosplice Wire Connector.

the entire building may be exposed to a dangerous hazard. There are also other reasons why the old method of soldering and taping wires should be condemned in modern loft buildings, department stores, and other public buildings that contain many people, and where electrical work is almost continually being done. With the old method a flaming torch must be carried around, sometimes over the heads of working people and many times over inflammable material. A torch may be accidentally upset, or the match that lights it carelessly thrown away, which would result in conflagration.

To overcome these difficulties a new connecting device, known under the name "Nosplice," has been placed on the market by the Morriseff Electric Manufacturing Company, 84 Walker Street, New York City. Fig. 1 shows the device which is five-eighths inch in diameter and two inches long and easily fits into even small outlet boxes. The interior construction is shown in Fig. 2, which makes clear how each wire is wedged into place. Around the center of the connector is a transverse metal band that carries a cover to be slipped over the screw heads.

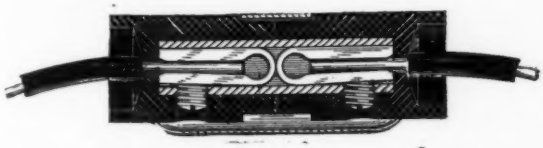


Fig. 2.—Interior Construction of Nosplice Connector.

The Nosplice device is being received with favor for new buildings, because a fixture can be removed by loosening one screw in each connector. It is a well known fact that tenants frequently call on the owners of buildings for either changing the location of fixtures or for substituting them. If a fixture should happen to be connected with solder and tape, it means that before it is removed the outlet wires must be cut and shortened, but if it is connected with this device, the fixture can be taken off by simply loosening one screw for each conductor.

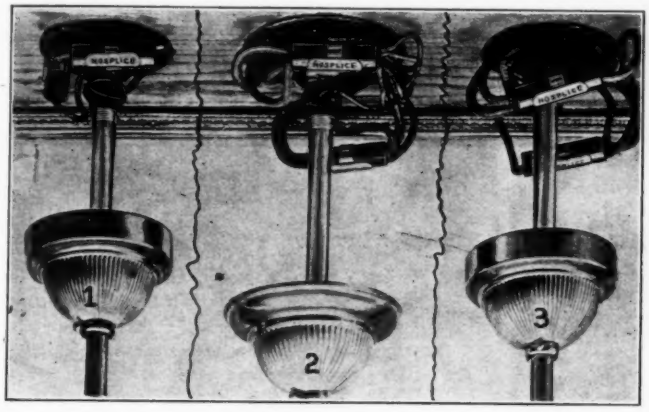


Fig. 3.—Use of Nosplice Connectors in Fixture Wiring.

Weatherproof Socket.

Pass & Seymour, Incorporated, Solvay, N. Y., has brought out an entirely new weatherproof socket which is illustrated herewith. This socket has a 0.5-inch aluminum cap and is supplied with six inches of stranded rubber-covered new Code wire. A groove is provided for a shade holder so that any standard shade holder intended for porcelain sockets may be used with it.

P. & S. Weatherproof Socket No. 423.

Wall Mounting for Circuit-Breakers.

The Delaware, Lackawanna & Western Railroad Company has placed an order with the Westinghouse Electric & Manufacturing Company for its Nanticoke power plant at Plymouth, Pa., covering a twelve-panel marble switchboard. The board is to control two 4,000-kilowatt, 4,400-volt, three-phase, 60-cycle turbogenerators and eight 2,000-kilowatt, three-phase, 4,400-volt feeders and provision is to be made for two future turbogenerators of the same rating.

The switchboard is particularly interesting in view of the application of a modification of the well known Westinghouse type E oil circuit-breakers, which in this installation are arranged for wall mounting on pipe-framework supports; in other words no cell structures will be required, thus making the whole a compact and neat installation.

A New Attachment Plug.

A compact attachment plug with a number of valuable features has been placed on the market by the Chi-Ill Electric Company, 5124 North Ashland Avenue, Chicago. To facilitate assembling and disassembling there is provided a release lock that can be quickly manipulated without the usual troublesome shell screws. A special cord lock is used to take from the terminals any tension resulting from pulling of the cord. The finger coves on the body give a good grip so that the plug may be easily screwed into place or removed.

Chi-Ill Attachment Plug.

Efficient Decorative Street-Lighting Units.

In the prevailing movement to secure decorative street lighting for those thoroughfares that are to be regarded as progressive the tungsten-cluster type of unit has proven the most popular. If properly designed and installed, it gives a pleasing light and lends itself easily to any desired amount of decorative treatment. In most instances, however, the advertising or display effect has been emphasized more than the lighting effect. In other words, the

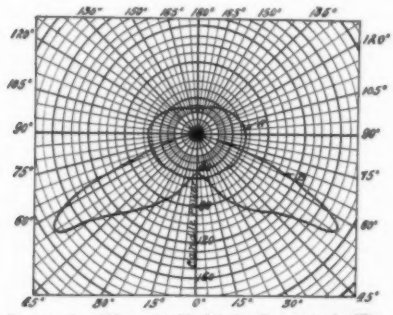
Ajax V and M Ornamental Post.

illuminating efficiency of the installation has usually been much below the value that should be attained.

A study of this subject made by a firm of prominent consulting engineers, Vaughn & Meyer, of Milwaukee, Wis., brought forth the conviction that the conventional tungsten-cluster post could readily be modified so as to greatly improve its efficiency as a light unit and at the same time introduce some desirable originality into the design. The manner in which both these features were brought about is shown in the accompanying view of one of the new posts.

The familiar glass balls have been done away with as inclosing globes and, in the case of the upper lamp, replaced by a pear-shaped globe of fairly dense opal glass. As this lamp is relied on more for its artistic than its illuminating effect, merely a 40-watt lamp is used. Practically all the illumination is obtained from the four pendent lamps on the arms of the post. These are 60-watt lamps provided with double reflecting and diffusing glassware. First there is a prismatic reflector (Holophane No. 591) which serves to throw through its open bottom, substantially all the light flux down upon and to distribute it uniformly over the street and sidewalk surfaces to be illuminated. Closely fitting over this is an opal shade to diffuse the remaining light flux that passes through the glass of the reflector and which would cause glare in the eyes of spectators; at the same time this shade protects the top of the reflector from street dust.

An idea of the effectiveness of this com-



Curve A—100-watt Multiple Tungsten with 12-inch Opal Ball.
Curve B—100-watt Multiple Tungsten with Holophane Unit No. 591.

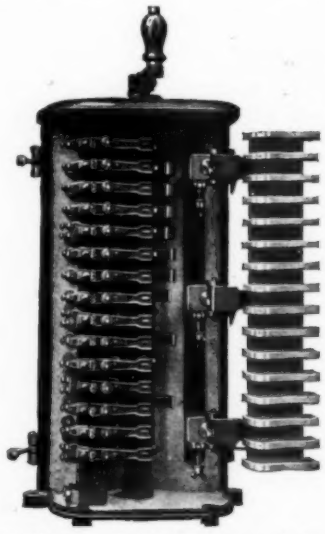
bination unit may be obtained from the comparative candlepower-distribution curves shown herewith. Curve *A* shows the distribution obtained with an ordinary opal-ball unit; curve *B* shows the distribution with the reflector unit. This diagram clearly demonstrates the high efficiency and uniformity of light distribution of the new type of unit.

In the design of the post itself, simplicity has been aimed for. Elaborate scrolls and excessive ornamentation have been avoided both in order to reduce the cost and to enhance the dignity of the design. By leaving off two of the arms the post becomes a symmetrical three-light post.

These new posts are being manufactured and marketed by the Ajax Line Material Works, South Milwaukee, Wis.

New Induction-Motor Starters and Speed Regulators.

The design of the inclosed drum-type controller for direct-current motors adopted last year by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has now been extended to cover several alternating-current types. The accompanying illustration shows the general construction of the drum for the new alternating-current starters, speed regulators, and crane and hoist-duty controllers. The non-stubbing, newly designed fingers are used, making straight-line contacts with the segments. An arc-proof shield is mounted under the finger board and so slotted as to interlace with the deflectors, preventing burning of the board and communication of arc from one finger to another. The operation is with an easy and smooth rotary motion. With the starter the resistance is entirely cut out of the rotor circuit when running normal, while with the speed regulator the operating handle may be moved backward or forward according to the variation in speed



Cutler-Hammer Motor Starter and Speed Regulator.

desired. Standard regulators are arranged to give 50-per-cent reduction in speed. The resistance used with these controllers varies according to the duty —whether for starting only or for regulating. The cast-metal grids are mounted in special mill-end frames on two supporting rods. These rods are covered with mica tubing and are also insulated from the end frame by fiber washers and tubes.

Electric Vehicle Climbs a 50-Per-Cent Grade.

A difficult test for any kind of a motor vehicle was recently applied in Wichita, Kans., and successfully met by a Waverly electric phaeton. A grade having a rise of 16.5 feet and a length of 32 feet was erected to show what a gasoline car could do. The electric car without any special preparation climbed the grade in 35 seconds and came down again safely.

The Williams Test Clamp.

Every wire chief and trouble man knows that in cases of trouble, breakdown or other emergency, speed in location and removal of the trouble is highly requisite. Everything resulting in the reduction by even a few minutes of the time that service is interrupted or impaired is worthy of consideration by central-station, telephone and other electric utility interests. A valuable appliance for facilitating this work has been placed on the market by the Williams Test Clamp Company, 225 High Avenue, Cleveland, Ohio.

As shown in the accompanying illustrations, two styles of this test clamp are made. Each is intended to afford a ready means of emergency connection to an insulated-wire circuit without scraping or cutting away the insulation. It saves the time otherwise used in hunting up exposed or terminal points of the circuit and permits immediate connection to any convenient or desirable test point without waste of time in skinning the wire.

Each type of clamp consists of a spring steel clamp whose jaws are quickly separated by squeezing the wide part between the thumb and forefinger. One of the jaws has a cross groove and recess for holding the wire which is to be tapped. Opposite this on the other jaw is a screw cap or stud in which are secured a number of sharp pin points or prongs. On release of the initial pressure these penetrate the insulation of the wire and are driven into firm electrical contact with the conductor itself by a little pressure of the thumb on the top of the stud. On squeezing the body of the clamp again, the contact is instantly removed. The point where the test clamp was applied may be marked with chalk or by tying a string and may later be taped at leisure, if it is necessary to protect the insulation where the prick points were made for the test.

As the pin points on the stud are apt to become blunt from "biting" into the conductors, the stud is made removable and may easily be replaced by screwing another in place. The rest of the clamp is indestructible. The clamps are highly polished and neat in appearance.

Style A, Fig. 1, has its ends brazed and riveted together, leaving a wireway into which may be soldered the wires leading to the voltmeter, telephone or other test instrument. Style B, Fig. 2, is of slightly different shape with a binding-post for attachment of the test-circuit wires.

Although primarily designed for test connections, the Williams clamp is very conveniently used for other emergency service, such as for tapping open electric light wires (Fig. 3), where no socket outlet is available but a light is imperatively needed for trouble work. In laboratories the clamps have been found very serviceable. Other uses readily suggest themselves to anyone familiar with their convenience and adaptability.

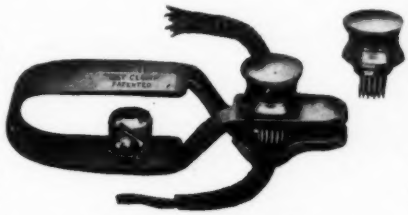


Fig. 2.—Style B Test Clamp.

Fig. 1.—Williams Test Clamp—Style A.

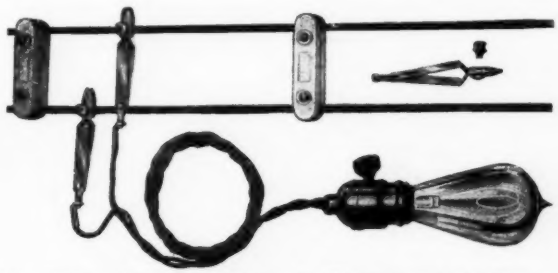


Fig. 3.—Use of Test Clamps for Emergency Light Tap.

Electric Motors for Irrigating Pumps.

Of late years the question of irrigation in the West has become a very important one, as far as the electrical industry is concerned, owing to the use of electric motors in connection therewith. One of the most interesting developments made recently is that of the Gem Irrigation District, located near Boise, Idaho, where it has been decided to build a large power plant for the purpose of irrigating the land and furnishing electrical energy to the farm lands in that vicinity. The acreage to be irrigated is somewhat indefinite at present, but the water rights permit the irrigation company to provide for the use of 290 second-feet of water at a level of 55 feet above low water in the river, 210 second-feet at a level of 90 feet above low water, and 110 second-feet at a level of 160 feet above that of low water. The pumping station will be located about 15 miles from Caldwell, Idaho, in a deep canyon on the Snake River. The power plant, which will be completed during 1913, will be located at Crane Falls on the Snake River, near Mountain Home, Idaho.

Electrical energy will be generated at 6,600 volts, stepped up to 66,000 volts and transmitted to the pumping station 65 miles distant, where it will be reduced by transformers to 2,200 volts for application to the pump motors.

The Crane Falls Power & Irrigation Company, which will install and operate the necessary pumping and electrical machinery for furnishing both water and power to the farmers of the district, has placed a contract with the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., for the following type-CCL, 220-volt induction motors for operating the pumps; three 1,025 horsepower, two 700 horsepower, two 330 horsepower, and two 255 horsepower; there were also ordered nine panel control switchboards and six 300-kilowatt oil-insulated step-down transformers.

For such irrigation as will be done during the season of 1912, power will be purchased and it is anticipated that the company's power plant will be in operation by 1913. Smith, Kerry & Chace, of Toronto, Canada, and Boise, Idaho, supervised the engineering features and drew the specifications.

Two More Railroads Adopt Telephones.

The ranks of the Southern railroads, which have adopted the telephone for train dispatching, have been swelled as a result of the East Carolina Railway Company's recent decision to use this method in handling the movements of its trains. The circuit will be about 40 miles in length, extending from Tarboro to Hookerton, N. C.

The Birmingham and Southeastern Railway has placed an order with the Western Electric Company, for the apparatus necessary to equip ten way stations with selective signaling apparatus.

The telephone circuit is to be of No. 14 copper wire, and will be approximately 46 miles in length, extending from Union Springs to Eclectic, Ala.

The General Railway Equipment Company—A Consolidation of Several Telephone Dispatching-Equipment Manufacturers.

The announcement made in the financial papers recently of the offer of bankers of the stock of the General Railway Equipment Company marks the accomplishment of a union of a number of selector telephone train-dispatching interests which has been under consideration for some months past. The new corporation has a capital of $15,000,000 and a board of directors of weight and influence in both the financial and the railway worlds. This board comprises Messrs. Newman Erb, long identified with the Hawley roads; Jules S. Bache, of J. S. Bache & Company, bankers; John W. Griggs, formerly Attorney General of the United States and counsel to the Marconi Company; James Gayley, former president of the United States Steel Corporation; W. G. Besler, vice-president and general manager of the Central Railroad of New Jersey; Charles N. Sigison, treasurer of the United States Electric Company; and George M. Seeley, of the National Telephone Selector Company. The new company succeeds to the business of the United States Electric Company, the National Telephone Selector Company, the Sandwich Electric Company, the Sandwich Pole Changer Company, the Charter Electric Company, the Electric Switch & Signal Company, and the International Telegraphic Call Company.

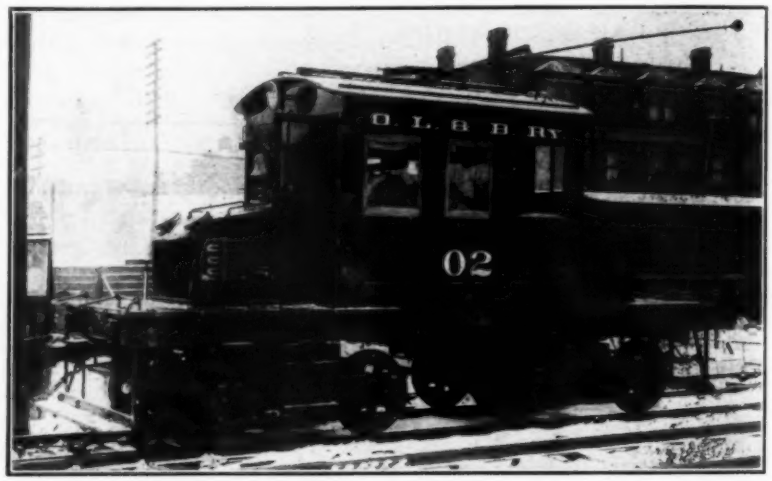
As is indicated by the names of the constituent companies, the General Railway Equipment Company comes into ownership and control of the Gill, the Sandwich, the National and the Wray-Cummings selectors, the aggregate of which in service is said to far outnumber those of all other makes combined. Besides these the new company will own and control a large number of patents, many of them basic and fundamental, covering the essential features of telephone dispatching and message and signal service as used on American railroads today.

The company will have the services of the engineers who have developed to its present efficient stage the art of dispatching, both in the selector and telephone-equipment branches and will begin business with a large number of orders on its books. Aside from the economies consequent on a centralized control, the new company will have at command a force of technical representatives both at its local offices and on the road, familiar with the requirements of the railroads and with a wide acquaintance among railroad officials. Its ample capital is a guarantee of its financial strength and of its ability to take care promptly of contracts of any magnitude. Its standard output will cover practically the entire line of railway electrical equipment.

Electric Locomotive for the Omaha, Lincoln & Beatrice Railway.

For switching and freight service on its city and interurban lines the Omaha, Lincoln & Beatrice Railway Company, which is operating in the vicinity of Lincoln, Nebr., has placed in commission the 3.5-ton Baldwin-Westinghouse electric locomotive which is illustrated herewith. This machine is particularly well fitted for its service, inasmuch as the components of its control equipment are the same as are standard for city and interurban-car applications. This assures an interchangability of parts which is of great convenience and value to an operating company.

Four Westinghouse direct-current type 101 K motors (each of which is rated at 65 amperes, and 35 horsepower at 500 volts) propel the locomotive. The gear ratio is 14 to 79. These motors are of the split-frame type and are arranged for bar suspension. In them



Locomotive for Omaha, Lincoln & Beatrice Railway.

are incorporated the maintenance-saving features characteristic of Westinghouse railway motors. Some of the most important of these features are spring-packer field coils, spider armature construction, bolted commutators, rugged brush-holders providing a uniform brush tension, and oil and waste lubrication. The motor is particularly suitable for switching-locomotive service because of its slow-speed characteristics. This means that with it heavy loads can be moved at slow speeds with a minimum draught of current from the station.

The locomotive is capable of exerting 15,750 pounds maximum tractive effort with a draught of only 206 amperes with motors in series and 412 amperes with motors in parallel. The draw-bar pull (one-hour rating) is 8,000 pounds at 6.2 miles per hour at 500 volts.

Pneumatically operated type HL control is used. The motors are permanently connected two in parallel. By operating the control handle these parallel groups can be connected in series and in parallel with each other and with the resistance necessary to produce smooth acceleration. Two master controllers are provided, one in each end of the cab. One noteworthy feature of this particular locomotive is that the important parts of the control equipment are all mounted in the center of the cab on an angle-iron frame where they are available for ready inspection. The reverser-switch group and resistors are supported in this rack with the resistors at the top, so the heat given off by them willl not raise the temperature of the other apparatus. Another advantage, beside that of ease of inspection, that results from mounting the equipments in one rack, is that the leads connecting the resistors, switch group and line switch are of minimum length.

The locomotive underframing is built up of steel sections and the cab and platform are of wood. The trucks are of the type standard with the Baldwin Company for locomotives of this type and have forged-steel side frames. Cast-iron, spoke-center, steel-tread wheels are used. Each end is equipped with a Master Car Builders' automatic coupler with a slotted knuckle on a radial draw bar, which permits the machine to haul a trailing load around a 50-foot-radius curve. The proportions of the door openings in the cab are such that all equipment housed within it can be readily removed.

In order that 30-foot rails could be transported, the railway company had the builders furnish four rail hooks. When necessary two of these hooks are engaged in sockets arranged for them, on each side sill of the locomotive. Each pair of hooks can carry three rails. When not in use the hooks are disengaged and carried within the cab.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

LINDSAY, CAL.—C. B. Morganthaler has been granted an electric light franchise.

NORFOLK, NEB.—The Norfolk Electric & Power Company will erect a power house. C.

MORRIS, MINN.—Bonds have been voted for the erection of a municipal light plant here. C.

BIG FALLS, MINN.—A franchise has been granted to Dahl & Shipley for an electric light plant. C.

UNION, N. J.—The Township Committee of Union has decided to extend lighting district No. 1.

KEOKUK, IOWA.—The Keokuk Gas & Electric Company will erect a substation to cost $100,000. C.

DICKINSON, N. D.—Nine blocks of the "white way" system of lighting will be installed in Dickinson. C.

OAKLAND, IOWA.—The Oakland Electric Company has purchased a site for a new electric light plant.

FAIRVIEW, IOWA.—The Sioux Valley Power Company will construct a power plant at a cost of $100,000. C.

GRISWOLD, IOWA.—J. W. Daily, owner of the electric light plant, will install three blocks of electroliers. C.

VERA CRUZ, MEX.—Valentine H. Lion, Jr., will install a hydroelectric plant on the Minas River in this state.

WILLISTON, N. D.—The Williston Electric Light Company has been incorporated with a capital stock of $10,000.

HILLS, MINN.—A. Thompson and Matthew Nelson have started a movement for the installation of an electric light plant. C.

GLENDORA, CAL.—Bids will be received until June 4 for a 50-year franchise for transmitting electricity along certain streets.

ROSEAU, MINN.—The citizens have donated a site to S. F. Benaime for a power plant, and he proposes to have it in operation this fall. C.

RED WING, MINN.—The arc-light system will be rebuilt and 14 new arc lights installed by the Red Wing Gas, Light & Power Company. C.

CLARINDA, IOWA.—The Lee Electric Company has purchased the plant of the Clarinda Electric Company and will extend its lines to Corning.

KENDALVILLE, IND.—It is reported that the City Council has decided to extend the boulevard lighting system along North Main Street.

ALAMEDA, CAL.—The City of Alameda has voted a bond issue in the amount of $60,000 for a new municipal electric lighting system.

ELKTON, MD.—The Home Electric Light & Power Company has been authorized to issue $50,000 worth of bonds for the extension of its facilities.

PORT LAVACA, TEX.—The Port Lavaca Manufacturing Company has been incorporated with a capital of $50,000, and will install an electric light system.

MACON, GA.—It is said that the Georgia Public Service Corporation, of which W. J. Massee is at the head, has purchased a site for its power house.

MONTREAL, ONT. — Montreal Light, Heat & Power Company is calling for tenders for the development of 100,000 horsepower at Cedar Rapids.

LAWRENCE, MASS.—The Board of Selectmen of Lawrence is investigating the lighting system of various places before deciding upon a system for Lawrence.

LE SUEUR CENTER, MINN.—It is reported that W. T. McCaskey & Company is making preparations to install an electric light and power plant.

WAYLAND, N. Y.—President G. R. Mills, of the Wayne Power Company, has announced that a power plant of 1,000 horsepower capacity will be erected at Wayland.

AMERICAN FALLS, IDAHO.—The Idaho Consolidated Power Company plans to erect a new power house in this city, at an approximate expenditure of $1,000,000.

MERCEDES, TEX.—The waterworks system and electric light plant here have been purchased by S. M. Williams, who will install gasoline engines and make other improvements. D.

CHEROKEE, IOWA.—The Cherokee electric light plant has been sold to A. A. Boyd and W. E. Wright, of Michigan City. A day service and other improvements will be made.

McALESTER, OKLA.—The Cole Electric Power Company has been incorporated with a capital stock of $25,000 by Preslie B. Cole, B. M. Cole and Rogers L. Cole, all of McAlester. P.

HOWARD LAKE, MINN.—It has been voted to sell the electric light plant to Eastern capitalists and grant them a franchise for 20 years. A large central plant wil be erected here. C.

SANTA ROSA, CAL.—The Great Western Power Company has been awarded a franchise in Sonoma County. It has a contract for the city lighting and must begin service by July 1.

LORDSBURG, N. M.—The Lordsburg Water & Electric Company will construct transmission lines to mines in the Shakespeare District for the purpose of providing power for the operation of machinery. D.

FOND DU LAC, WIS.—The Eastern Wisconsin Railway & Power Company will expend $50,000 for equipment and improvements at its power plant. The overhead system in the residence district will be rebuilt. C.

PERTH AMBOY, N. J.—The City Clerk has been instructed to notify the Public Service Corporation and the New York Telephone Company to place their wires underground on Smith and State Streets in this city.

FLORESVILLE, TEX. — The City Council has granted a franchise to J. H. Spencer, of San Antonio, and associates to install an electric light and power plant here. The construction work is to be started by September 1. D.

EAU CLAIRE, WIS.—The Chippewa Valley Railway, Light & Power Company expects to build a new transmission power house to aid in transmitting current from the Cedar Falls plant to patrons in Eau Claire and Chippewa Falls.

LAWTON, OKLA.—A charter has been granted to the Lawton Railway & Lighting Company. The capital stock is $10,000 and the incorporators are B. R. Stephens, W. H. Fuller, R. L. Scheig, B. W. Hilgard and B. E. Tabler, all of McAlester. P.

DEL NORTE, CAL.—The Mountain Power Company has filed articles of incorporation with $1,500,000 capital stock. The incorporators are F. P. Brewer, of Pasadena; Carrie M., H. S. and J. S. Owen, of Los Angeles, and F. D. Stout, of Chicago.

ELLWOOD, PA.—It has been announced that a high-voltage transmission line will be built from Ellwood to Youngstown, O., by the Pennsylvania Power Company. The construction of a 15,000-steam power station is being planned to be erected at Lowellville.

DEER RIVER, MINN.—The Everton Electric Light & Power Company has filed articles of incorporation with the Secretary of State. The capital stock is $50,000 and the incorporators are Warren A. Everton, L. B. Everton and Leonard Scott, all of Deer River.

MICHIGAN CITY, IND.—W. E. Sheeler Electric Company has secured a contract for the installation of a boulevard lighting system on Franklin Street. The contract calls for 125 lamps of the cluster type, which requires nearly 10,000 feet of underground wiring. The cost of this installation will be over $9,000. S.

CITY OF MEXICO, MEX.—The Mexican Light & Power Company has adopted plans for a further development of its water supply for the operation of its hydroelectric plant at Necaxa in the mountains about 110 miles from this city. It will drive 22 new tunnels, each nine feet in diameter, with a total length of more than 13 miles through the mountains to tap the Zao Palo watershed. D.

SAN FRANCISCO, CAL.—The Oro Electric Corporation, successor of the Oro Water, Light & Power Company, has placed on the market $3,500,000 first-mortgage bonds, the proceeds from the sale of which will be devoted to the development of power projects in Southern California. All bonds of the old company will be retired. Power will be transmitted in a steel power line, with Oakland as an ultimate destination.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

BURWELL, NEB.—The Garfield Mutual Telephone Company has been incorporated.

THIEF RIVER FALLS, MINN.—There is agitation here for a municipally owned telephone company. C.

CURTIS, MICH.—Whitefish Lake Telephone Company has been incorporated with a capital stock of $1,500.

STERLING, MINN.—The Sterling-Amboy Telephone Company will construct an extension of two miles. C.

UNDERWOOD, N. D.—The North Dakota Independent Telephone Company will build a line from this place to Turtle Lake. C.

FRAZEE, MINN.—The Frazee Telephone Company has been organized by W. F. Just and others. The capital stock is $11,000. C.

ROCHESTER, MINN.—The Rochester Telephone Company contemplates enlarging its system and the installment of more equipment. C.

SWANVILLE, MINN.—The Morrison and Todd County Telephone Company will connect with the Morrison County long distance lines. C.

KEOKUK FALLS, OKLA.—The Keokuk Falls Telephone Company, of which Fred O. Irick is president, will make extensions to its line.

BARNES, WIS.—Barnes Telephone Company has been incorporated with a capital stock of $2,000 by George S. Barnes, Horace L. Barnes and May Barnes.

SATTRE, IOWA.—The Sattre Telephone Company has been incorporated with a capital stock of $1,500 by S. J. Thompson, Edward Lund and Thomas Otteson.

BADGER, MINN.—The farmers have organized a telephone company to be known as the Stokes, Nereson and Barnet Telephone Company. Construction will begin at once. C.

CHIPPEWA FALLS, WIS.—The Tri-State Telephone Company has secured an option on the Chippewa County Telephone Company's lines and a new system will be installed here. C.

LOXLEY, ALA.—L. J. Taylor, Loxley, is president and J. R. Cross is secretary of the Heart of Baldwin Telephone Company, which has been organized to construct a system.

SHARON, TENN.—Sharon Rural Telephone Company has been organized with a capital stock of $5,000. The incorporators are Arden Somers, Arnold Roberts, O. R. Beard and others.

DES MOINES, IOWA.—The Miller Telephone Company of Van Buren Township has been incorporated with a capital stock of $150. The incorporators include Edward Miller, E. A. Clausen and Henry Miller.

BETHPAGE, TENN.—The Bethpage exchange of the Sumner County Telephone Company has been sold to a stock company at this place, and a new switchboard and other improvements are contemplated.

UNITY, WIS.—Atwood Telephone Company has been incorporated with a capital stock of $600. The incorporators are William Rusch, William Hardrath, Fred Molle, David Mandel, Edward Lessing and Henry Molle.

DONNYBROOK, N. D.—The Renville Telephone Company has been incorporated with a capital stock of $48,000. The directors of the company are C. J. DeVore, S. B. Oke, J. Steinbegea, A. E. Swanson and Amil Gludt.

MASONTOWN, W. VA.—Masontown Telephone Company has been incorporated with a capital stock of $5,000. The incorporators are W. H. Post, A. W. Hawley, George W. Rohr, S. L. Cobun and Earl Dixon, all of Masontown.

ST. PAUL, MINN.—Height of Land Telephone Company has been incorporated with a capital stock of $2,500. The incorporators are George W. Brager, Ole N. Eckman, of Brager; John Sperling, Benjamin Hammann, Detroit, Mich., and Mark Chamberlain, Senjen, Minn.

NASHVILLE, TENN.—Sharon Rural Telephone Company has been incorporated with a capital stock of $5,000. The incorporators are Arden Somers, Arnold Roberts, O. R. Beard, H. B. Stephens, W. E. Adams, J. C. Stewart, F. F. Lawrence, W. N. Bullington and O. J. Walsh.

NASSAU, N. Y.—The Nassua Cooperative Telephone Company has been organized and plans are under way for immediate construction of a line. John L. Bame is president of the company and Ralph M. Cooper, secretary-treasurer. The directors are John L. Bame, Ralph M. Cooper, Delmar Lynd, Oscar Winters and Lester Clapper.

ELECTRIC RAILWAYS.

(Special Correspondence.)

COUNCIL BLUFFS, IA.—The street car company will replace its rails on Main Street with 90-pound rails. C.

DULUTH, MINN.—The Greater Duluth Commercial Club is agitating the extension of the car lines to the steel plant at Spirit Lake. C.

DALLAS, TEX.—It is stated that E. P. Turner and associates are planning to build an interurban railway through Rockwall County, *via* Buckner Orphans' Home and New Hope toward Heath.

LOUISVILLE, KY.—The Louisville Railway Company is preparing to build a power house on High Street, the total cost of which will be $700,000.

MENDOTA, ILL.—The Mendota-Ottawa Electric Railway Company has obtained the right of way for an extension of its road to the north end of the county.

NORFOLK, VA.—The stockholders of the Virginia Railroad Company have ratified a bond issue, part of which will be used in improvements and extensions.

PERTH AMBOY, N. J.—The New Jersey Central Traction Company has been granted a 50-year franchise to run a trolley line between Red Bank and Long Branch.

IOWA CITY, IA.—Frank Tanner and others have bought the entire interest of Smith & Dows, of Cedar Rapids, in the proposed Eastern Iowa railway and will build a line to Muscatine. C.

EAGLEVILLE, TENN.—Mr. Cox, builder of the proposed Shelbyville and Franklin Interurban Railroad, has stated that very soon engineers will be put at work locating the route of the new line.

LIBERTY, N. Y.—The Sullivan Railroad Company has been organized with a capital stock of $200,000 for the purpose of constructing an electric road from Liberty to Jeffersonville, *via* White Sulphur Springs.

GREENBURG, PA.—A committee consisting of John M. Jamison, B. B. Fulmer and J. L. Kunkle has been appointed to push forward the project of a trolley line between this place and New Alexandria.

GUTHRIE, OKLA.—Announcement has been made by the Oklahoma Railway Company that it will extend its interurban from Moore to Norman, and that the line will be built north from Edmond into Guthrie within this year.

LEXINGTON, KY.—The Kentucky Traction & Terminal Company, of Lexington, Ky., may extend its line from Nicholasville to Lancaster. The Lexington-Nicholasville line is one of several radiating from Lexington into Bluegrass territory. G.

MADISON, WIS.—Work on the proposed line around Lake Monona will be started about June 1 by the Chicago & Wisconsin Valley Company, the $40,000 bonus required for the building of this line having been secured. C.

MADISON, WIS.—The Western Indiana Construction Company, general contractors for the Chicago and Wisconsin Valley Railway, will receive bids until May 25 for the construction of a road bed and laying track between here and Portage, Middleton Junction and Prairie du Sac. C.

CINCINNATI, O.—Plans for a traction line from Paris, Ky., to Cincinnati are being made by A. L. Claiborne, of Richmond, Va.; J. B. Walker, of Cincinnati, and A. C. Walker, of Luray, Va. The line is to run through the Licking River Valley, and surveyors are now in the field. G.

INDIANAPOLIS, IND.—The Indianapolis Construction Company has been organized and is preparing to build 47 miles of standard-gauge electric railway to connect Glasgow and Hodgenville, Ky. Cassius C. Hadley, Indianapolis, is president of the new company, and James H. Costello, secretary.

TAYLORSVILLE, KY.—The Louisville & Taylorsville Traction Right of Way Company has been organized to secure rights of way and prepare for the construction of a traction company from Louisville to Taylorsville. John Speed is president; L. F. Jewell, vice-president, R. D. Barker, treasurer, and R. L. Thurman, secretary of the new company. G.

DALLAS, TEX.—The Texas Electric Company has been organized with a capital stock of $100,000 for the purpose of constructing an interurban electric line from Dallas to Austin *via* Palestine, a distance of about 225 miles. J. V. Watkins, of Dallas, is president of the company. It is stated that arrangements for financing the project have been made. D.

ALPINE, TEX.—The construction of an interurban electric line between Alpine and Grand Dalls, a distance of about 100 miles, is being promoted by the people along the route. There is much development being done in the way of irrigation in the territory which is to be traversed by the proposed line, and a transportation outlet for both passenger and freight traffic is said to be badly needed. D.

CITY OF MEXICO.—The project of constructing an interurban electric railway from Monterey to El Porvenir through the beautiful El Diente Canyon has been revived by the Monterey Railway, Light & Power Company. The plans for the proposed extensions now under construction contemplate that the municipal Government of Monterey and the Riviro family shall give substantial financial aid to the project D.

FOREIGN TRADE OPPORTUNITIES.

(Parties interested in the following items should address the Bureau of Manufactures, Washington, D. C., and refer to the file number noted.)

NO. 8754. ELECTRIC CARS AND MATERIAL FOR LIGHT AND POWER COMPANY.—An American consular officer in a Latin American country has been requested by the board of directors of a light and power company in his district to forward the information that the company would be willing to accept a reasonable proposition from any manufacturers in the United States of electric street cars, and from any manufacturers of supplies for electric tramways, for about 20 electric street cars and such supplies as are required for an electric tramway or an electric-light plant. Copy of the complete report can be obtained from the Bureau of Manufactures.

NO. 8752. CONCESSION FOR NEW ELECTRIC LINES.—A Municipal Council in a Latin-American city has ordered a commission to present a project for a concession for new electric car lines within the city. The concession will be for the construction of the road and its operation for 75 years, after which the property will pass to the city. Copy of the report will be mailed to interested firms by the Bureau of Manufactures.

NO. 8753. ELECTRIC LIGHTING FOR CITIES IN WEST INDIES.—The American consul at Guadeloupe, French West Indies, has submitted a report on the possibilities for electric-light plants in various cities of the West Indies; also translations of the Government concessions for Guadeloupe, Basse Terre, and Pointe a Pitre. The concessionaires are not able to work some of these and are willing to transfer them under certain conditions. Particulars may be obtained from the Bureau of Manufactures.

NO. 8770. CONCESSION FOR ELECTRIC TRAMWAYS.—An American consular officer calls attention to an adjudication which has been opened for a system of electric tramways for a certain Asiatic city, including several important suburbs. Bids will be received until June 15 and American contractors having the proper financial backing are urged to consider this concession. Copy of the conditions of contract can be obtained from the Bureau of Manufactures.

NEW PUBLICATIONS.

EDUCATION.—The annual report of the Commissioner of Education for the year ended June 30, 1911, has been issued by the United States Bureau of Education, Washington, D. C. Among the topics dealt with are vocational training, progress in industrial education, and training of vocational teachers in Germany. There is a final chapter containing an educational directory of the country.

THE INVENTOR'S OUTLOOK.—The publication of a monthly journal devoted to the interests of inventors has been started by J. J. O'Brien, at Washington, D. C. It is known as *The Inventor's Outlook*. The first issue is dated May, 1912. It includes among other things an article by Charles P. Steinmetz, some "dont's" for inventors and the first installment of a serial by the editor on "The Truth About Patents." The object of the new periodical is stated to be consideration of the interests of inventors and the promotion of needed legislation.

MICA—The United States Geological Survey has issued a report on mica as an advance chapter from "Mineral Resources for 1911." This report is prepared by Douglas B. Sterrett and contains, in addition to a general discussion of production, consumption and imports, notes on a number of new deposits.

NEW INCORPORATIONS.

GALVESTON, TEX.—The Texas Electric Construction Company has been incorporated with a capital stock of $1,000.

CHICAGO, ILL.—The Hayre Electric Company has been incorporated with a capital stock of $2,000 for the purpose of manufacturing and dealing in electrical appliances. I. S. Blumenthal, Maurice Alschuler and C. C. Brosius.

CLEVELAND, O.—The Electrical Novelty Company has been incorporated with a capital stock of $10,000 to deal in electrical novelties. The incorporators are Thomas J. Sheftall, Jr., John C. Temple, George R. Brown J. F. James and Anna Bartholomew.

BISMARCK, N. D.—Williston Electric Construction Company has been incorporated with a capital stock of $25,000. The directors are Sidney J. Dorothy, Elmore C. McCall and William C. Tatem, of Williston, and George H. Moellring and W. W. Wirtz, of Ray.

PHILADELPHIA, PA.—The High Tension Engineering Company will take out a Pennsylvania charter to manufacture and sell electrical machinery and apparatus covered by the Smith patents. The incorporators are Franklin S. Smith, R. M. Vankerchen and Alexander Rennick.

PROPOSALS.

ELECTRIC SPOT-WELDING MACHINE.—Sealed proposals will be received by the Navy Department, Bureau of Supplies and Accounts, Washington, D. C., until June 18 for one electric spot-welding machine to be delivered at Mare Island, Cal., as per schedule 4579.

ELECTRICAL GOODS.—Sealed proposals in duplicate will be received until June 10 by the Quartermaster at West Point, N. Y., for supplying the United States Military Academy with electrical goods for the year ending June 30, 1913. Schedules may be had upon application at West Point.

ELECTRIC CONDUITS AND WIRING, AND INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until June 18 for electric conduits and wiring, and interior lighting fixtures of a one-story building to be used as the post office at Kingfisher, Okla. Drawings and specifications may be obtained from the custodian of the site or from the office of the Supervising Architect.

ELECTRIC LIGHT SYSTEM AND POWER PLANT.—Sealed proposals will be received at the office of the Chief Quartermaster, San Francisco, Cal., until May 31 for the construction of an electric lighting system at Fort Columbia, Wash.; also for furnishing and installing engine, generator and switchboard in present power plant at Fort Stevens, Ore., and for construction of feeder lines and pump house with pumps and motor at Fort Stevens. Plans and specifications may be seen only in the offices of the Quartermaster, Fort Columbia, Wash.; Fort Stevens, Ore.; Portland, Ore., and the office of the Chief Quartermaster.

FINANCIAL NOTES.

Notwithstanding the fluctuation and falling off in security values, there appears to be extant a feeling of cheerfulness and hardy optimism. This is significant considering the backwardness of the planting season with its possibility of disappointment in the future of the crops. Industrial operations, however, have increased materially, and basic prices show susceptibility of responding to higher values. Reports of earnings are discouraging and the labor outlook is not entirely cloudless. There is a strong underlying belief that as soon as settled weather conditions set in the untoward features which have been developed will be rapidly dissipated, and an impetus given to the movement for more material prosperity than has been a possibility for the last eighteen or twenty months.

It has been announced that the Salem Street Railway Company, a property of the Portland Railway, Light &Power Company, has been sold to the Portland, Eugene & Eastern Railway, which is controlled by A. Welch, who also is the owner of the Salem, Falls City & Western Railway.

The Kentucky Public Service Company has purchased the property of the Clarksville Gas Company and also the electric lighting business heretofore operated by the Clarksville (Tenn.) Railway & Light Company. The new company proposes to rebuild the gas works and make other improvements. The Kentucky Public Service Company owns and operates the gas and electric plants at Hopkinsville, Ky.; Bowling Green, Ky.; Lexington, Ky.; Frankfort, Ky., and the gas company at Ownesboro, Ky.

A $1,000,000 charter was signed by Judge Charlton in the Superior Court at Savannah, Ga., for the Savannah Power Company, the concern which will build the big power plant for the Savannah Electric Company. The incorporators are George J. Baldwin, Marcey L. Sperry, Jacob Paulsen, Bierne Gordon and John A. G. Carson. Osborne & Lawrence are attorneys for the company. Provision is made in the charter for increasing the capital stock to $2,500,000 if the occasion should demand.

The Kuhn banking interests of Pittsburgh, Pa., are planning the organization of another corporation to develop waterpower in West Virginia. This new company was chartered in West Virginia some time ago and now its initial capital stock of $25,000 has been increased to $27,000,000 with a view to beginning active construction. Its name is the Black River Water & Power Co. and its stock is divided into 270,000 shares, of which 65,000 are six-per-cent cumulative preferred and 205,000 shares are common stock. The power sites are located on the Black Fork River, in Tucker County, and engineers are now investigating with the intention of determining the amount of horsepower available and the details of construction necessary to develop economically the energy. William S. Kuhn and James S. Kuhn are active in this new organization. Their plan for the West Penn Traction & Power Company, a $27,000,000 corporation that will develop the waterpower of Cheat River in West Virginia, was announced in April.

The Committee on Railroads of the Massachusetts Senate voted on May 8

to report a bill for the lease of the Boston & Maine to the New York, New Haven & Hartford Railroad, and for the electrification of the railroads entering Boston. The bill provides for the abolition of the Boston holding company, the expenditure of $80,000,000 by the New Haven Road, and $20,000,000 by the Boston & Albany within the next five years in electrifying the lines within the metropolitan district, and that the New Haven Road shall establish physical connection with the Boston & Maine by means of a four-track tunnel under the city. Another tunnel under the harbor to East Boston is to be constructed if deemed necessary by the Railroad Commission and the Port Directors. The bill also provides for the purchase by the New Haven Road of two-thirds of the stock of the Boston & Maine, and stipulates that any outside railway may enter Boston over the tracks of existing roads. It is also provided that the State may take over the railways within the electrified zone at any time.

The $210,000 issue of five-per-cent forty-year gold bonds of the Sayre Electric Company has been listed on the Philadelphia Stock Echange.

Thomas B. Dailey and Charles H. Wilson were elected directors of the New England Telephone & Telegraph Company, succeeding John F. Hill and F. D. Proctor.

At the annual meeting of the General Electric Company, held in Schenectady, all retiring directors were reelected with the exception of the substitution of I. S. Keeler for T. Jefferson Coolidge, Jr. Mr. Keeler is assistant secretary of the General Electric Company. At the meeting 450,000 shares were voted.

Daniel B. Ely & Company are offering 1,000 shares of the six-per-cent cumulative preferred stock of the Associated Gas & Electric Company, of New York, on a six-and-one-half basis of income. Control of this company was recently purchased by Montgomery, Clothier & Tyler, of Philadelphia, and J. G. White & Company (Inc.), of New York, and operation was taken over by the new management on April 1. Annual report for 1911 shows earnings of 6.4 per cent on the common stock, after payment of operating expenses, fixed charges and six-per-cent dividend on the preferred.

An issue of $1,100,000 Ashville Power & Lighting Company first mortgage thirty-year five-per-cent sinking-fund gold bonds is offered in part at ninety-five and interest, yielding about 5.35 per cent, by the Equitable Trust Company and Redmond & Company, of New York city, and Hambleton & Company, of Baltimore. The bonds are due April 1, 1942, and are redeemable at 105 and accrued interest. The company owns the entire street railway, gas, and electric-lighting properties of Asheville, which is the distributing center for the western part of North Carolina.

Dividends.

Citizens Traction Company; a regular semi-annual dividend of three per cent, payable May 16.

Connecticut Railway & Lighting Company; a quarterly common dividend of one per cent, and a preferred dividend of one per cent, both payable May 15 to stock of record May 1.

Federal Utilities; a quarterly preferred dividend of 1.5 per cent, payable June 1 to stock of record May 15.

Kings County Electric Light & Power Company; the regular quarterly dividend of two per cent payable June 1 to stock of record May 21.

North American Company; quarterly dividend of 1.25 per cent, payable July 1 to stock of record June 15.

St. Joseph Railway, Light, Heat & Power Company; a quarterly common dividend of 0.5 per cent, payable June 1 to stock of record May 15.

Studebaker Corporation; a quarterly preferred dividend of 1.75 per cent, payable June 1 to stock of record May 15.

Report of Earnings.

PACIFIC POWER & LIGHT.

The Pacific Power & Light Company (including Walla Walla Railway) reports to the New York Stock Exchange for the twelve months ended December 31, 1911, compares as follows:

Gross earnings	$1,153,279
Expenses and taxes	631,978
Net earnings	528,301
Interest	335,599
Surplus	185,702

UNDERGROUND ELECTRIC RAILWAYS.

The Underground Electric Railways' (London, Eng.) statement of receipts and expenses of associated companies, for the month of March, compares as follows:

	1912	1911
Metropolitan District Railway:		
Gross receipts	£65,625	£64,237
Net receipts	33,773	34,650
London Electric Railway Co.:		
Gross receipts	£67,042	£67,184
Net receipts	34,922	35,249
London United Tramways, Ltd.:		
Gross receipts	£25,676	£24,547
Net receipts	5,523	5,220

UNITED RAILWAYS INVESTMENT COMPANY.

The United Railways Investment Company has issued its report for the year ended December 31, 1911. The profit and loss account compares as follows:

	1911	1910
Dividends on stock owned	$2,044,672	$2,044,672
Interest on loans, etc.	91,862	64,889
Total income	2,136,536	2,109,561
Charges, general expenses, etc.	1,295,709	1,343,093
Net income	*840,827	766,468
Previous surplus	2,368,778	1,602,311
Discount on notes	99,375	.....
Profit and loss surplus	3,110,230	2,368,778

*Equal to 5.25 per cent earned on $16,000,000 preferred stock as compared with 4.79 per cent earned on same stock previous year.

REPUBLIC RAILWAY & LIGHT.

The consolidated earnings of subsidiary companies of the Republic Railway & Light Company, for the month of March and twelve months ended March 31, 1912, compare as follows:

	1912	1911
March gross earnings	$ 206,172	$ 182,989
Net after taxes	77,216	65,029
Surplus after charges	32,791	20,605
Twelve months gross	2,434,161	2,267,499
Net after taxes	966,761	904,879
Surplus after charges	433,776	394,234

Above statement does not include earnings of Pennsylvania Power Company.

JANEIRO TRAMWAY EARNINGS.

The report of the Rio de Janeiro Tramway, Light & Power Company for the year ended December 31, 1911, shows net revenues of $6,767,028, against $5,393,092 in 1910. The income account compares as follows:

	1911	1910
Gross revenue	$12,952,317	$10,960,180
Operating expenses	6,185,289	5,567,088
Net revenue	$ 6,767,028	$ 5,393,092
Other income	13,979	40,484
Total income	$ 6,781,907	$ 5,433,576
Interest, general and legal expenses, taxes, etc.	3,072,412	3,096,433
Surplus	$ 3,708,595	$ 2,337,143

LACLEDE GAS-LIGHT.

The report of the Laclede Gas Light Company for the three months ended March 31, 1912, shows net earnings of $583,057, against $610,013 in 1911. The income account compares as follows:

	1912	1911
Gross earnings	$1,142,727	$1,177,378
Net after taxes	583,057	610,013
Depreciation	67,440	63,456
Balance	$ 515,616	$ 546,556
Int. and pref. dividend.	283,767	281,919
Surplus	$ 231,849	$ 264,637

FEDERAL TRACTION.

The report of the Federal Light & Traction Company for the fiscal year ended March 31, 1912, shows net earnings of $555,645, an increase of $21,926. The income account for March and for the twelve months ended March 31, follows:

	1912	Increase
Gross earnings	$111,748	$12,893
Operating expenses	67,677	9,369
Net earnings	$ 44,071	$ 3,524
Twelve months:		
Gross earnings	$1,305,803	$86,375
Operating expenses	750,158	64,449
Net earnings	$ 555,645	$21,926

The above figures do not include earnings of the Trinidad Electric Transmission Railway & Gas Company, the returns for which are given below:

	March.	12 mos. end. March 31.
Gross earnings	$20,055	$235,311
Operating expenses	15,260	165,615
Net earnings	$4,795	$69,696

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	May 13.	May 6.
Allis-Chalmers common (New York)	1	1¼
Allis-Chalmers preferred (New York)	1⅞	3½
American Tel. & Tel. (New York)	145¾	146
Commonwealth Edison (Chicago)	142	146
Edison Electric Illuminating (Boston)	292	292
Electric Company of America (Philadelphia)	*12	*12
Electric Storage Battery common (Philadelphia)	55	55
Electric Storage Battery preferred (Philadelphia)	55	55
General Electric (New York)	169	168
Kings County Electric (New York)	129	129
Manhattan Transit (New York)	2⅜	1⅞
Massachusetts Electric common (Boston)	19½	19
Massachusetts Electric preferred (Boston)	95	*95
National Carbon common (Chicago)	112	112½
National Carbon preferred (Chicago)	116¼	117¼
New England Telephone (Boston)	155	153
Philadelphia Electric (Philadelphia)	19⅛	18
Postal Telegraph and Cables common (New York)	82	82½
Postal Telegraph and Cables preferred (New York)	68⅝	68⅝
Western Union (New York)	83¾	83
Westinghouse common (New York)	76	75
Westinghouse preferred (New York)	118	120½

*Last price quoted.

PERSONAL MENTION.

A. PODMORE, assistant engineer to the Constantinople Telephone Company left London on April 30 to take up his duties in Constantinople.

W. H. EDWARDS, Lake Charles, La., has been promoted to the position of district manager of the Cumberland Telephone & Telegraph Company, with headquarters at Lafayette, La.

J. LOGAN KANIPE, for the past two years local manager for the Southwestern Telephone Company, Corpus Christi, Tex., has tendered his resignation to take effect June 1.

B. F. MITCHELL, who has been local manager for the Cumberland Telephone Company, Madisonville, Ky., has been promoted to the position of manager of the entire district.

LOUIS E. BEILSTEIN has resigned his position as general manager for the Toledo Railways & Light Company. Mr. Beilstein has not announced his future plans.

F. C. PULLEN, of the Evansville Electric Light & Power Company, Evansville, Ind., will take up the duties of sales manager for the St. Joseph (Mo.) Railway, Light, Heat & Power Company, June 1.

JOSEPH T. ORME, vice-president of the Lowry National Bank, Lowry, Ga., has been elected president of the Georgia Railway & Electric Company, to succeed Preston S. Arkwright, who will become president of the Georgia Railway & Power Company.

D. McFARLAN MOORE has been retained by the General Electric Company, and is at present connected with the Harrison Lamp Works. The General Electric Company has purchased the entire Moore Lighting interest, and the old Moore light plant at Newark has been closed.

EDWIN M. SURPRISE, of the New England Telephone & Telegraph Company, gave a talk on "Private-Branch Exchange" on May 14 before the Boston Plant Chapter of the Telephone & Telegraph Society of New England.

DAVID B. RUSHMORE, of the General Electric Company, is in Porto Rico looking after his interests in fruit raising. Mr. Rushmore is taking an active part in the development of plans for an engineers' club in Porto Rico, to be used by Americans who seek to escape the severity of the winter season in this country.

FRANK C. BARRINGTON, sales manager for the St. Joseph Railway, Light, Heat & Power Company, has accepted a position with the Incandescent Lamp Department of the Westinghouse Electric & Manufacturing Company, Bloomfield, N. J. Mr. Barrington has been in electrical work since 1892 and for several years past has been connected with the former company.

T. T. LOGIE, superintendent of the gas and electric light plant at South Norwalk, Conn., has been chosen as superintendent of the municipal gas and electric light plant, Westfield, Mass. Mr. Logie is a graduate of Sheffield Scientific School of Yale, and, although but 27 years of age, has been engaged in his present work for the past six years. The Commissioners feel that they have secured a first-class man and will give him entire charge of the gas and electric light plants, and of the office.

DATES AHEAD.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., May 20-22.

Oklahoma Electric Light, Railway & Gas Association. Annual meeting, Oklahoma City, Okla., May 22-23.

Electrical Supply Jobbers' Association. Atlantic City, N. J., May 22-24.

Mississippi Electric Association. Fourth annual convention. Vicksburg, Miss., May 28-30.

American Society of Mechanical Engineers. Spring meeting, Cleveland, O., May 28-31.

National Electric Light Association. Annual convention, Seattle, Wash., June 10-14.

Minnesota Electrical Contractors' Association. Annual convention, Duluth, Minn., June 16.

Canadian Electrical Association. Annual convention, Ottawa, Ont., June 19-21.

Michigan Section of the National Electric Light Association. Annual convention on board the *Majestic*, sailing from Port Huron, Mich., on June 21.

National District Heating Association. Annual convention, Detroit, Mich., June 25-27.

Society for the Promotion of Engineering Education. Annual meeting, Boston, Mass., June 26-29.

American Institute of Electrical Engineers. Annual convention, Boston, Mass., June 25-28.

National Electrical Contractors Association. Annual meeting, Denver, Colo., July 16-19.

Ohio Electric Light Association. Annual convention, The Breakers, Cedar Point, O., July 17-19.

International Association of Municipal Electricians. Annual convention, Peoria, Ill., August 26-30.

International Association for Testing Materials. Sixth congress, New York City, September 3-7.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Pfister, Milwaukee, Wis., September 16-21.

The 1912 Boston Electric Show, Mechanics Building, Boston, Mass., September 28-October 26.

American Electric Railway Association and its five affiliated associations. Annual convention, Chicago, Ill., October 7-11.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual meeting, Manhattan, Kans., October 17-19.

With the Electrical Manufacturers

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a descriptive leaflet, No. 2458, describing and illustrating the type T direct-current turbogenerator. The details of construction of the turbine and of the generator are given, with views of the component parts, the completed machines and complete installations.

Eck Dynamo & Motor Company, Belleville, N. J., announces the removal of its New York office from 19 Murray Street to 31 Warren Street. The new office will be under the management of W. L. Fort, for many years connected with the Western Electric Company in New York. Mr. Fort's many friends in the trade will doubtless be pleased to know his new location.

The General Electric Company, Schenectady, N. Y., has received an order for 221 motors ranging from 1 to 200 horsepower in size from the Brunswick-Balke-Collender Company. This company is one of the largest manufacturers of billiard tables and their equipment in the world. Its new factory at Dubuque, Iowa, will be completely equipped with individual motor drive.

A. Hall Berry, 97 Warren Street, New York City, general sales agent for the Tubular Woven Fabric Company, is sending out to the contracting trade bulletins with return card descriptive of Duraduct, the non-metallic flexible conduit with the roller-bearing wireway. Claim is made that Duraduct eliminates the greater part of conduit difficulties, reduces friction in fishing by 75 per cent, and that it can be roughly handled in hot or cold temperatures without injury.

The Tungstolier Company, Conneaut, O., has issued Bulletin No. 120, describing the new Tungstolier weatherproof industrial lighting unit recently placed on the market. The unit illustrated throughout the pages of this bulletin is especially designed to meet the demand for a weatherproof unit that can be used for factory lighting where the fixture is partially exposed to the weather and where there is a demand for an electrical unit for either inside or outside use. Copies of this bulletin may be had by writing to the company.

W. N. Matthews & Brother, St. Louis, Mo., have just issued their general catalog No. 8 for 1912. This is a 154-page book giving full and well illustrated descriptions of the firm's many electrical specialties, such as the Matthews guy clamps, cable clamps, cable rollers, cable-splicing joints, lamp changers, fuse switches, guy anchors, lamp guards, Polerector, Telafault, etc. Several articles from the technical press bearing on the use of some of these specialties are included. Over a third of the book is devoted to useful data

and information of general interest to engineers, particularly those having to do with overhead line construction.

Westinghouse, Church, Kerr & Company, engineers, have been retained for the following new work, the materials and equipment for which have been ordered: Gamewell Fire Alarm Telegraph Company, design and construction of manufacturing plant 50 by 208 feet, four stories and basement, at Newton Upper Falls, Mass. New Bedford Gas & Edison Light Company, New Bedford, Mass., design and construction of 5,000-kilowatt substation. Utah Light & Railway Company, Salt Lake City, design and construction of 8,500-kilowatt addition to power plant; original 8,500-kilowatt station was built by Westinghouse, Church, Kerr & Company in 1910.

The H. W. Johns-Manville Company is about to build a new industrial town to be known as Manville, N. J. More than 300 acres of land have been bought on the site of what is now known as Finderne. Here will be erected what are destined to be the largest and best equipped factories in the world for the manufacture of asbestos and magnesia products—roofings, textiles, packings, insulation materials and other J-M products. The company has gone into the enterprise with characteristic thoroughness. All buildings will be of fireproof, steel construction. In conception, design and erection, the plant will be typical of all that is best and most representative in modern industrial construction. Another large factory is now being erected by the company in the Claremont section of Jersey City, which will be the most modern and best equipped plant in the world for the manufacture of cork insulation materials.

The Cravens Electric Company, recently formed in Chicago, is another evidence of the modern tendency of engineers to enter the commercial field after several years of practical manufacturing experience. The company was organized by George W. Cravens, who has been in the engineering, manufacturing and selling divisions of the electrical business since early in 1893 when he became associated with the General Electric Company at Lynn, Mass. During the fourteen years he was with that company Mr. Cravens worked on every type of apparatus made by it except steam turbines, either as designer, department foreman or engineer. In 1907 he came to Chicago as an engineer for the Goodman Manufacturing Company, manufacturers of electrical coal-mining machinery. Two years later he established himself independently as consulting engineer, specializing on isolated power plants, industrial betterment and machine design. Upon the reorganization of the Delta-Star Electric Company on its present basis, Mr. Cravens joined it as engineer, having charge of the design and manufacture of its line of electrical devices, which position he has held during the past two years. Mr. Cravens is a member of several engineering, technical and commercial societies. He is a frequent contributor to the technical press on electrical and manufacturing matters and is an associate editor of the *Railway Electrical Engineer.* The Cravens Electric Company will bring out a general and very complete line of electrical devices for use in all branches of the electrical field but will specialize on the development of special devices and systems to meet specific demands. The company will also make it a business to develop and market the inventions of others on a royalty basis and will act as sales agent for various concerns making supply parts and materials. It also stands ready to act in a consulting capacity for any of its customers.

George W. Cravens.

The Engineering Department of the National Electric Lamp Association, which is sustained by certain works of the General Electric Company, will maintain an elaborate exhibit at the electrical show to be held in conjunction with the National Electric Light Association's convention at Seattle, Wash., June 10 to 13. Booths 45, 46, 53 and 54, which are prominently located in the exhibit hall, have been reserved. The exhibit will consist of a complete line of Mazda incandescent lamps and some of the apparatus used by the Engineering Department in its testing laboratories. The main feature of the exhibit will be a large metal fixture, finished in statuary bronze, bearing six rows of branches from which various sizes of Mazda lamps fitted with reflectors are to be suspended. The fixture is about 10 feet in height and is surmounted by a 500-watt lamp. Ralph Beman, director of technical publicity of the Engineering Department, National Electric Lamp Association, will be in charge of the exhibit.

Record of Electrical Patents.

Issued by the United States Patent Office, May 7, 1912.

1,025,121. Drying Chamber for Electric Cables. A. Cassirer, Charlottenburg, Germany. The cable drums are inserted into adjoining sections of a horizontal cylinder whose partitions are heated by steam pipes.

1,025,130. Arc Lamp. J. L. Dinsmoor, New York, N. Y. The upper edge of the inner globe communicates with a cooling chamber between the casing and inner sleeve.

1,025,140. Potential Switch. J. D. Ihlder, assignor to Otis Elevator Co., East Orange, N. J. A cam on the motor shaft locks the switch in closed position unless the voltage drops.

1,025,144. Electric Foot Warmer. F. Kuhn, assignor to American Electrical Heater Co., Detroit, Mich. Two rods surrounded by heating elements hold the casing together; between the heaters and casing is granular heat-absorbing material.

1,025,167. Telephone Repeater System. H. B. Stone, Providence, R. I. Has an auxiliary repeating coil inductively connecting the transmitting and receiving circuits.

1,025,208. Electric Fixture. L. Schepmoes, Hasbrouck Heights, N. J., assignor to Safety Car Heating & Lighting Co. A berth lamp with prismatic reflector and switch.

1,025,230. Lamp Socket. E. G. K. Anderson, assignor to Benjamin Electric Manufacturing Co., Chicago, Ill. A composite attachment plug and socket with a pull switch.

1,025,232. Spark Plug for Internal Combustion Engines. V. G. Apple, Dayton, O. The central conductor and the insulating sleeve are fused together near their ends.

1,025,237. Switch Socket for Electric Lamps. R. B. Benjamin, assignor to Benjamin Electric Manufacturing Co., Chicago, Ill. Relates to the construction of the socket key.

1,025,238. Weatherproof Electric-Lamp Socket. R. B. Benjamin, assignor to Benjamin Electric Manufacturing Co. To the top of the casing is secured a threaded bushing for attachment to the fixture; into the base of the casing screws a shade-holding ring that also supports the base and socket.

1,025,239. Electric Lamp Socket. R. B. Benjamin, assignor to Benjamin Electric Manufacturing Co. A reflector socket with the casing and reflector integral.

1,025,245. Combined Fuse Contact-Clip and Terminal Holder. R. C. Cole, assignor to Johns-Pratt Co., Hartford, Conn. Is made from a blank having one part for the clips and connected to it a part for the terminal.

1,025,246. Fuse-Block Clip. R. C. Cole, assignor to Johns-Pratt Co. The clips have depressed integral lugs fitting into recesses in the base block.

1,025,247. Inclosed Fuse. R. C. Cole, assignor to Johns-Pratt Co. Has a number of separate fuse links secured to internal fuse-terminal disks.

1,025,268. Insulating Compound and Process of Making the Same. E. Hemming, assignor to Hemming Manufacturing Co., Garfield, N. J. A hard, baked, molded mass composed of asbestos, coal-tar pitch, and a non-volatile residue of anthracene oil.

1,025,269. Telephone System. E. R. Hobbs, Buhl, Idaho. Current is supplied through the cut-off relay in one

direction for testing and the opposite direction for talking.

1,025,281. Electric Heater for Liquids. J. R. Lawson, Dallas, Tex., assignor of one-third to W. H. Yoakum, and one-third to C. W. White. A tubular water heater providing for circulation around the electrodes.

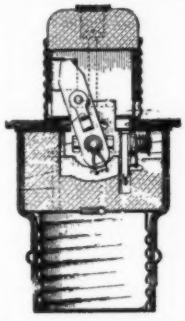
1,025,313. Lighting Fixture. N. L. Schloss, New York, N. Y. An incandescent lamp and socket are mounted in a tubular casing the lower half of which is made of glass.

1,025,336. Automatic Spark-Timing Mechanism for Internal-Combustion Engines. T. Townson, Philadelphia, Pa. A centrifugal governor is geared to the time shaft that controls the contacts.

1,025,347. Combined Telephone and Alarm System. H. G. Webster, assignor to Kellogg Switchboard & Supply Co. Grounding of the circuit outside the exchange actuates the alarm signal.

1,025,357. Automatic Electric Cutout Switch. R. Winterhalder, Kamloops, B. C., Can. Failure of line voltage opens the circuit-breaker.

1,025,366. Telephone Equipment. J.



1,025,230.—Pull-Switch Plug Socket.

B. Briggs and V. P. Hall, Labette, Kans. A selecting mechanism for party lines includes an electromagnetically rotated disk at each telephone.

1,025,371. Traffic-Controlling System for Railroads. C. J. Coleman, New York, N. Y., assignor to Hall Signal Co. The car carries a coil to induce in the track rails a signal-actuating electromotive force.

1,025,378. Telephone-Service Meter. A. M. Crichton, Quincy, Ill. When the called party answers, a wave-form current is sent to actuate the calling party's meter before his talking circuit is closed.

1,025,394. Portable Electric Lamp. E. Gottschalck, assignor to Electric Export-Werke, G. M. B. H., Berlin, Germany. The lamp is kept in a metal casing whose lock can be opened only with a magnet.

1,025,401. Process of Curing Hides. F. P. James, assignor to Electric Meat Curing Co., Cleveland, O. The hides are washed, then immersed in salt solution and an electric current passed through the same.

1,025,407. Arc-Light Electrode. I. Ladoff, Cleveland, O., assignor of three-tenths to P. C. Peck. A metallic pencil composed preponderatingly of iron and comprising a bore containing potassium fluoride.

1,025,411. Treatment of Brine. G. W. Malcolm and F. T. Munton, assignors to The Salt Union, Ltd., Liverpool, England. The brine is electrolyzed to form sodium hydrate and then partly carbonated before adding to raw brine to precipitate the magnesium and calcium salts in the latter.

1,025,427. Acoustic Optical Telegraph. A. Sanandres, New York, N. Y. Includes an electromagnet, an armature, a gauge and an indicator.

1,025,442. Electric-Light Bracket. A. F. Anderson and C. W. Armstrong, Tacoma, Wash. A lazy-tongs swiveling and extension bracket carrying an incandescent lamp at the end.

1,025,454. Double-Throw Switch. R. Cannan and J. A. Misland, Brooklyn, N. Y. A snap knife switch with spring locking dogs.

1,025,455. Electric Regulation. J. L. Creveling, New York, N. Y., assignor to Safety Car Heating & Lighting Co. An axle-driven car-lighting system with a lamp-circuit regulator controlled by the potential difference between the generator and storage battery.

1,025,464. Vapor Electric Apparatus. P. C. Hewitt, assignor to Cooper Hewitt Electric Co., New York, N. Y. A mercury rectifier with an auxiliary anode.

1,025,469. Tubular Metallized Filament. M. A. Hunter, assignor to General Electric Co. Carbonaceous material is produced around a core of titanium carbide; the latter is then vaporized and the carbon metallized.

1,025,471. Telegraph Transmitter. J. R. Jones, Detroit, Mich. Includes a vibratory member and a mercury contact.

1,025,477. Telephone System. J. G. Mitchell, assignor to North Electric Co., Cleveland, O. A trunk signaling circuit between the A and B operators at an exchange.

1,025,479. Trolley Wheel and Harp. W. W. Neighbour, assignor to Suspension Ball Bearing Manufacturing Co., New York, N. Y. Provides special means for conducting the current from the wheel to the harp.

1,025,488. Engine-Room Return Signal. V. H. Street, Berkeley, Cal. The sending dial has a set of contacts and the receiving dial has corresponding lamps and means for acknowledging the signal.

1,025,498. Control of Electrically Operated Switches. H. E. White, assignor to General Electric Co. Electromagnetic switches control successive contactors in the rotor circuit of an induction motor.

1,025,499. Process of Making Incandescent Lamps. W. R. Whitney, assignor to General Electric Co. Occluded gases and moisture are removed from the walls of the bulb by heating, passing in a current of hydrogen and then exhausting.

1,025,506. Driving Mechanism for Generators. W. L. Bliss, assignor to United States Light & Heating Co., New York, N. Y. Relates to car-wheel-driven train-lighting generators.

1,025,509. Means for Causing Mercury to Circulate while Electrolyzing Aqueous Solutions of Metallic Salts. R. Carl, assignor to Siemens & Halske, A. G., Berlin, Germany. A pipe connecting the two lower ends of the cell to form a circulating mercury ring is cooled at one end and electrically heated at the other.

1,025,519. Electric Lamp Bracket. G. J. Dormandy, assignor of one-half to United Shirt & Collar Co., Troy, N. Y. Consists of three parts: an adjustable body, a head for the lamp stem and a universal joint.

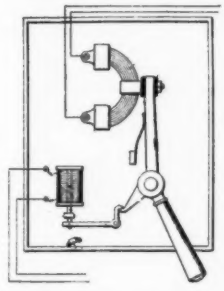
1,025,532. Protective Device for Electrical Apparatus. R. H. Manson, assignor to Dean Electric Co., Elyria, O. A special mounting for a lightning arrester.

1,025,537. Gas or Electric-Light Extension Fixture. C. M. Pitel, Meriden, Conn. Includes a spring drum connected to an extension tube within the inner tube.

1,025,545. Means to Electrically Control Street Switches. S. K. Stinger, Jr., and H. K. Robinson, Phialdelphia, Pa. The tongue of a track switch is electromagnetically moved.

1,025,547. Magnetically Controlled Friction Gearing. A. Sundh, assignor to Otis Elevator Co., Jersey City, N. J. Combined with a friction roller is an iron ring in rolling contact therewith, and a magnet, the ring forming an armature for the magnet.

1,025,559. Automatic Electric Regulator. W. L. Bliss, assignor to United



1,025,357.—Circuit-Breaker.

States Light & Heating Co., New York, N. Y. A regulator for a car-lighting system is pneumatically actuated under electromagnetic control.

1,025,566. Breaker Box for Ignition Systems. W. J. Hart, assignor to C. F. Splitdorf, New York, N. Y. A casing for the make-and-break device.

1,025,573. Terminal Clip. V. H. Keller, Hatfield, Mass. Has a spark gap between the clips and body.

1,025,576. Means for Regulating the Temperature of Electrical Heating and Cooking Apparatus. J. C. P. Kirkwood, assignor to H. D. Vickery, Wellington, New Zealand. A flatiron has a thermostatic circuit-closer and circuit-breaker.

1,025,585. Switch Box. B. A. Nelson, Dixon, Mo., assignor of one-half to W. T. Goodman. Circuit-controlling devices are mounted in a sealed box adjoining the track rail.

1,025,590. Reverse-Phase Relay. H. E. Rice, assignor to W. C. L. Eglin, Philadelphia, Pa Opens a circuit-breaker when one of the phases becomes reversed.

1,025,634. Terminal and Contact for Snap Switches. C. H. Machen, assignor to Chelten Electric Co., Philadelphia, Pa. Has angular ends perforated for attachment to the support.

1,025,675. Berth Lamp. W. J. Bohan, St. Paul, Minn. Has the socket plate vertically adjustable in the casing.

1,025,679. Transformer Case. L. H.

Burkhart, Warren, Pa. A special construction of the base to support the weight of the transformer element.

1,025,690. Telephone Attachment. J. L. Donat, Chicago, Ill. Has an enlarged casing surrounding the transmitter mouthpiece.

1,025,691. Switch Handle. C. W. Eisenmann, assignor to Perkins Electric Switch Manufacturing Co., Bridgeport, Conn. Provides special means for securing the handle to the switch spindle.

1,025,698. Motor-Drive for Calculating Machines. H. Hopkins, assignor to Moon-Hopkins Billing Machine Co., St. Louis, Mo. The keys control connection of the motor to the driving shaft of the machine.

1,025,701. Telephone and Telegraph Contact for Movable Bodies. H. F. Kunicki and M. Swiecicki, Philadelphia, Pa. Beneath the car is a shiftable yoke carrying a contact wheel adapted to engage one of the rails.

1,025,713. Call Box. J. G. Nolen, assignor of one-half to F. B. Cook, Chicago, Ill., and one-half to Automatic Fire Protection Co. The handle of a spring alarm-circuit-closing motor is held from turning by a fusible link.

1,025,715. Thermo-Electric Pyrometer. W. S. Peake, assignor to Taylor Instument Companies, Rochester, N. Y. A thermo-electric couple is connected to the measuring instrument by copper and copper-nickel wires.

1,025,726. Automatic Timer. F. Waller, Jr., Lynbrook, N. Y. An adjustable contact-making mechanism includes two clutch members.

1,025,727. Water and Sewage Ejector. A. C. Wells, Amityville, N. Y. Includes an automatic solenoid-controlled valve.

1,025,738. Electric Alarm for Mail Boxes. J. W. Coe, Jr., Yonkers, N. Y. Movement of a pendulum closes the alarm circuit.

1,025,742. Pendent Electric Lamp Socket. G. W. Goodridge, assignor to Bryant Electric Co., Bridgeport, Conn. Provides strain relief between the wire terminals and the tubular neck.

1,025,760. Electroplating Process. F. J. McElhone, Jersey City, N. J. Electroplates are made by washing the case with an ink solvent that deposits a fine conducting surface, then rinsing and plating with acidulated copper sulphate.

1,025,763. Process for Making Insulating Tubes. V. P. v. Pindtershofen, Wiener-Neustadt, Austria-Hungary. Sheet fabric is rolled on a mandrel to form a tube, moisture is removed from this in a vacuum and an insulating compound impregnated.

1,025,786. Relay. A. S. Cubitt, assignor to General Electric Co. The core moves in the actuating coil against the force of a spring and an auxiliary coil.

1,025,812. System of Motor Control. E. Krause, assignor to General Electric Co. Includes a motor-generator set with variable voltage impressed on the working motor.

1,025,813. Telephone Cabinet. G. W. Lancaster, Richmond, Va. The transmitter and receiver are mounted in a casing on top of a tiltable pedestal adjoining the desk.

1,025,835. Coil-Winding Machine. H. G. Sahlin, assignor to General Electric Co. For bending copper ribbon edgewise into coils.

1,025,843. Storage Stove. W. Stanley, assignor to General Electric Co. Heats a normally heat-insulated body by electric current, and conducts heat from the body when desired by a path of low thermal resistance extending through the insulation.

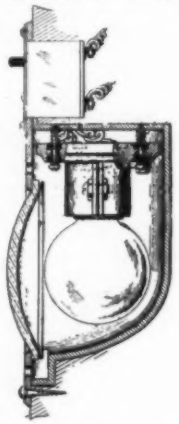
1,025,844. Ignition for Internal-Combustion Engines. C. L. Terry, Elyria, O. Includes a generator, a battery, two make-and-break devices, a spark coil, a solenoid and a mercury cup for each spark plug.

1,025,846. Protection for Electrical Systems. M. O. Troy, assignor to General Electric Co. An automatic polyphase circuit-breaker for preventing excess leakage current between the high-tension circuit and ground.

1,025,852. Automatic Cutout for Electric Heaters. W. S. Andrews, assignor to General Electric Co. A thermostatic release for the switch.

1,025,857. Fuse Plug. P. A. Grendel, assignor to Bryant Electric Co., Bridgeport, Conn. An Edison fuse plug in which the fuse lies horizontally across the fuse chamber.

1,025,876. Control of Electric Motors. J. G. V. Lang, Southall, England, assignor of one-half to E. H. Johnson.



1,025,675.—Berth Lamp.

Provides means for controlling shunts around the fields of a set of series motors.

1,025,877. Art of Regulating Electric Motors. J. G. V. Lang, Davenport, Ia., assignor of one-half to E. H. Johnson. A regenerative braking and control system for railway motors.

1,025,892. Electric Sign. W. H. Weeks, New York, N. Y. A flasher for spelling out the words of the sign.

1,025,896. Attachment for Electric Lights. J. C. Zubli and A. Vles, Seattle, Wash. Includes a number of colored reflectors and an oscillating diaphragm of triangular prisms.

1,025,908. Transmission of Music by Electromagnetic Waves. L. de Forest, New York, N. Y., assignor to De Forest Radio Telephone Co. Includes an oscillating circuit in which are produced practically continuous vibrations of a frequency higher than that of audibility; a musically affected modifying circuit is associated with the oscillating circuit.

1,025,928. Casing for Incandescent-Electric-Lamp Sockets. C. C. Schoeneck, Syracuse, N. Y. Relates to means for securing the shell and cap together.

1,025,932. Means for Producing Light. C. P. Steinmetz, assignor to General Electric Co. Combined with an arc drawn from a mercury terminal, are means for continuously furnishing to the arc anhydrous iodides of alkali metals furnishing red rays.

Patents That Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired May 14, 1912:

539,022. Method of and Means for Assembling Commutator Segments. A. F. Batchelder, Schenectady, N. Y.

539,024. Electrical Connector. F. N. Bell, Milford, Conn.

539,032. Carbon-Brush Holder for Dynamos. W. S. Bosley, Chicago, Ill.

539,079. Electric Push-Button. A. J. Oehring, Chicago, Ill.

539,086. Telephone Transmitter. R. F. Rice, Hartford, Conn.

539,099. Annunciator Connection for Multiple Switchboards. G. Taintor, Keene, N. H.

539,105. Variable Rheostat. E. P. Warner, Chicago, Ill.

539,123. Cross-Arm for Carrying Electrical Wires. T. T. Eckert, New York, N. Y.

539,142. Telephone Circuit and Apparatus. C. W. McDaniel, Kansas City, Mo.

539,150. Electric Lamp. W. H. Sheppard, New York, N. Y.

539,154. Railway Signal System. G. L. Thomas, Brooklyn, N. Y.

539,163. Telephone Transmitter. A. C. Brown, London, Eng.

539,170. Magneto Call Apparatus. F. B. Cook, Chicago, Ill.

539,184. Closed-Conduit Electric Railway. P. Lucas, Berlin, Germany.

539,192. Electric-Light Head-Gear for Personal Wear. A. M. Rodriguez, Brooklyn, N. Y.

539,216. Rheostat. A. C. Carey, Lake Pleasant, Mass.

539,222. Electric Conductor. J. R. Harr, Baltimore, Md.

539,234. Electric Fire and Water Alarm. G. S. Neu, New York, N. Y.

539,242. Car Wheel for Electric Cars. C. Thompson, Oswego Falls, N. Y.

539,277. Electric Motor. J. C. Lincoln, Rochester, N. Y.

539,293. Controller for Electric Motors. H. F. Parshall and J. W. Darley, Jr., Lynn, Mass.

539,298. Communicating, Signaling, Etc., To or From Movable Objects. J. Y. Porter, Cleveland, O.

539,299. Electric Track-Switch. J. Y. Porter, Cleveland, O.

539,354. Signaling System. J. P. Coleman, Swissvale, Pa.

539,358. Electric Stop Motion for Warping Machines. Clayton Denn, J. Cocker and Chas. Denn, Philadelphia, Pa.

539,365. Electric Arc-Lamp Clutch. W. B. Luce, Brookline, Mass.

539,369. Means for Effecting Synchronism. J. H. Rogers, Washington, D. C.

539,376. Starting Box for Electric Motors. D. M. Bliss, Boston, Mass.

539,381. Apparatus for Indicating and Signaling Speed of Vehicles. J. W. Darley, Jr., Baltimore, Md.

539,392. Arc Lamp. C. A. Pfluger, Chicago, Ill.

539,393. Electric Arc Lamp. C. A. Pfluger, Chicago, Ill.

539,396. Railway Signal. J. Stringham, Jersey City, N. J.